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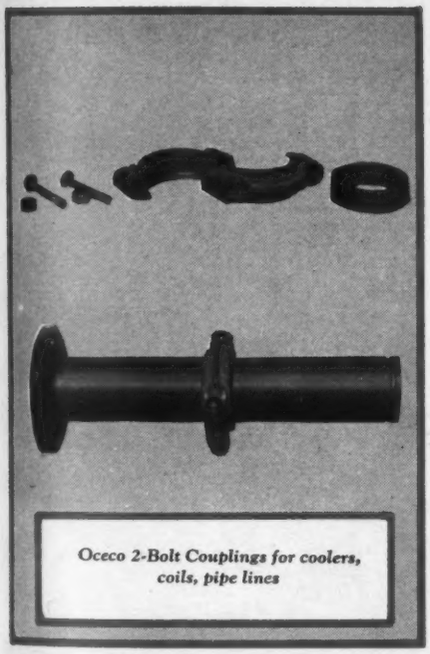

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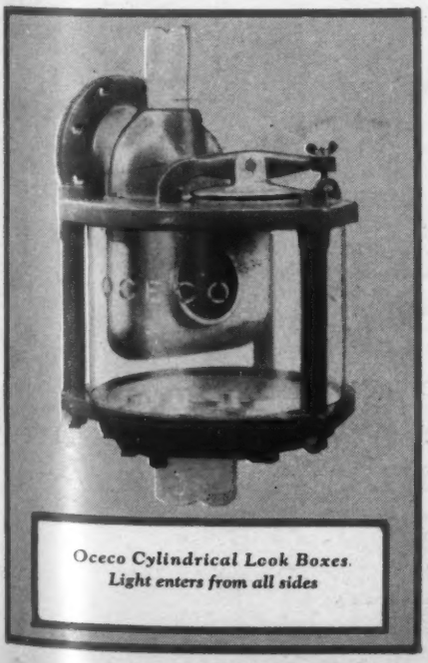

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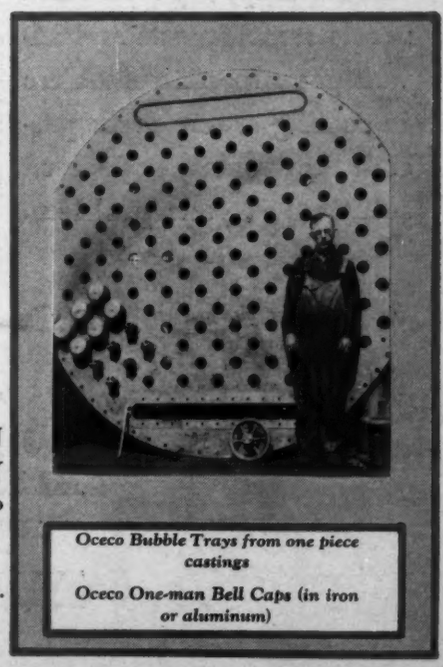

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OCTOBER, 1929

GRADY TRIPLETT, *Editor*

GEORGE REID, *Associate Editor*

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Keep the Eyes On Consumption

GO thumb through the pages of the issues of an oil publication for five years back is to get a story of calamity. Powell was heralded as a market breaker. Smackover drew the word, menace. Wortham was designated as too much for the price structure. Later came West Texas, which is still holding its threat. Seminole is still sitting on quotations. Now we have Oklahoma City and Kettleman Hills.

Such is the condition of the development of a new oil pool. It brings to the surface a product that is essential to the travel of the world and still its discovery brings dejection.

It is to the discredit of a major industry, however, that the wells of any pool are allowed to overflow the huge reservoir of consumption. If all the diamonds in the raw were allowed to reach the finished state, their prices would drop. It is not the number of diamonds in the mines nor the number that have known the edge of cutting tools that fix the market. It is the number that dazzle the eyes of the buyer, which determines price.

Likewise the petroleum industry will better its position when sensible refinery control, rather than some new discovery of crude oil, determines how much gasoline is available.

It is the refining division of the petroleum industry, which stands as a dam between the flush fields of new oil and the reservoir of consumption. Consumption for a year can be calculated with such accuracy that any man can know in advance how much gasoline the world will consume in a year. When the refining plants of the world allow more gasoline to enter that reservoir than the world will accept, they are enemies of the petroleum industry. Instead of opening the gates into the reservoir of consumption, when crude oil is in abundant supply, they should be so manipulated to allow a flow of gasoline to equal requirements.

This is not a job for concerted action, but rather for individual action. The sales executive of any refining concern can determine what his plant can sell within a period. When still runs of individual plants are so controlled that this figure is met, there will be profit in gasoline, regardless of how much crude oil producers are dangling before buyers.

Profitable refinery operation should keep its eyes toward the consumer and not toward the seller of raw material. Indications point toward an over-supply of crude oil for a long period. The refiner will do well to ignore this and look into what amount of finished materials he can sell. There is no profit in buying crude oil, for its price is uniform. Profit comes from selling, but selling is not to be defined as the offering of material in excessive amounts. Sound selling involves the control of output to the point that the price will pay for the raw material, its processing, its distribution and an ample return on investment.

In the final analysis it is a one-plant, and usually a one-man, duty. Some person has authority to determine what a plant or a company will do. He can get statistics to guide him wisely. There is no lack of facts. The definiency has been crudely defined in a word of three letters, which can be more politely indicated as the tubular part of the anatomy, encompassed by the midsection.

Grady Gilbert

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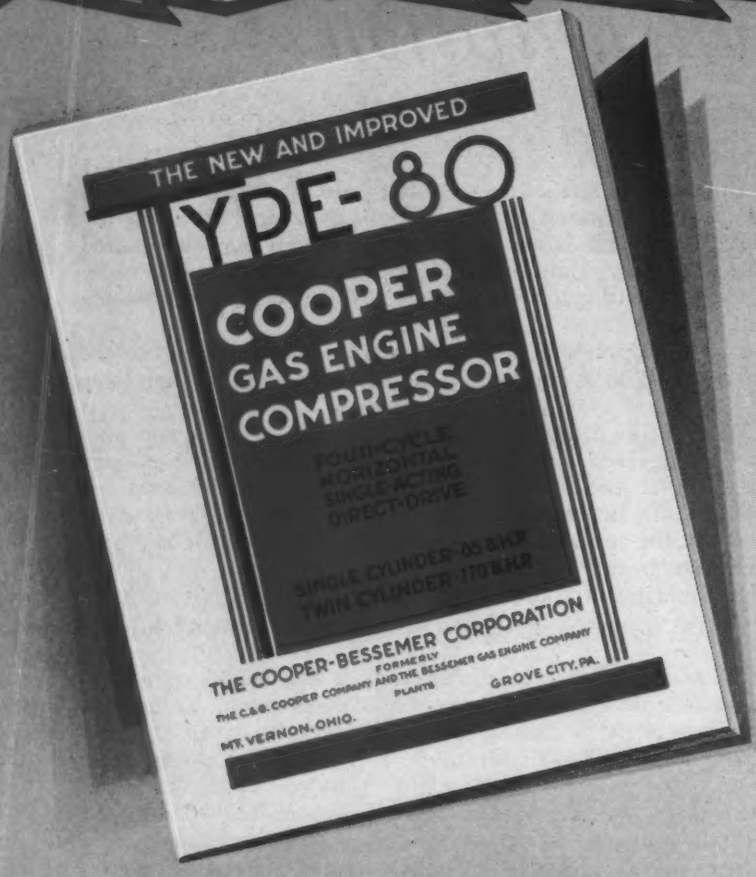

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Govers Process Built on Use of Diphenyl As Indirect Heating Medium

By GEORGE H. REID
Associate Editor

THE Govers Process for refining lubricating oils which has been perfected by Dr. Francis X. Govers, director of research, for Indian Refining Company, Lawrenceville, Illinois, has for some time, been attracting much interest in the refining industry. The manufacturing branch of the petroleum industry is interested in the development of this process because of the wax-free nature of the finished lubricants, and because of the engineering principles utilized for the first time by any refiner. Probably the most important of the new developments involved is the utilization of a new and different heating medium — diphenyl.

Briefly the Govers Process consists of vacuum distillation of skimming plant residuum followed by solvent extraction of paraffin, certain chemical treatment, filtration, and subsequently a second vacuum distillation. The details of the process will be discussed shortly in a paper being prepared by Professor Arthur Wells, consulting engineer, of Cambridge, Massachusetts. Utilization of diphenyl as a heating medium was discussed informally and for the first time by Dr. Govers and Professor Wells, at a symposium in Philadelphia of the American Institute of Chemical Engineers on June 20.

Technologists have been experimenting with various mediums for indirect heating of petroleum oils or fractions for many years, several processes have been developed and many patents granted covering the use of fusible metals in the molten state, such as lead, mercury in the vapor state and sulphur in the vapor state. It is not known that any processes are in commercial operation at present which utilize any indirect heating medium other than mercury vapor. The employment of diphenyl, which a few years ago was classed as one of the rare chemicals, or at least was only a laboratory product, comes as something new, and the product is free from the dangers and hazards attending the use of any other of the commercially practical indirect heating mediums. This fact accounts for the great interest evinced in the use of diphenyl by engineers and chemists in all of the industries in this country where indirect heating is not only applicable but desirable and often necessary.

CHARACTERISTICS OF DIPHENYL

It is said that when Dr. Govers decided to use diphenyl for heating purposes there was not over a "hat full" of the product in this country. Early experiments in its manufacture were discouraging because of the cost factor. It became necessary then for Dr. Govers to assist in the perfection of a process for the preparation of diphenyl at low cost. At present the chemical is manufactured commercially and cheaply by the Federal Phosphorus Company, Birmingham, Alabama.

Diphenyl is a coal tar derivitive having a flake-like appearance in its solid state, somewhat similar to naphthaline, but has a sweet odor. At ordinary temperatures diphenyl is solid but melts to the liquid state at 158°. It enters the vapor state above its boiling point of 484°. From this temperature up to 913° it suffers no decomposition, which means that the critical temperature of this product is approximtaely 913°. Other characteristics which contribute to its importance as a heating medium are found in the fact that diphenyl has a vapor pressure of only 110 pounds at 750°; a specific heat of approximately .4 at 750° and a latent heat of vaporization of approximately 110 B.t.u.'s at 750°. The thermodynamic properties of diphenyl are being studied at the University of Michigan and elsewhere and will soon be published.

In the Govers process the diphenyl is vaporized in a tubular heater similar to the modern boiler and the vapors pass to a single effect-vacuum evaporator where a mineral oil fraction between 485° and 625° is volatilized and taken off in an overhead condenser. Pressure in the still is about 5 mm. It is reported that with a waste heat boiler a thermal efficiency of 83 per cent. has been obtained for the entire process.

NEED FOR INDIRECT HEAT

In the preliminary informal discussion of the utilization of diphenyl at Philadelphia, Dr. Govers and Prof. Wells presented many interesting facts concerning the new heating medium. The following discussion is quoted from the informal paper read at that time:

"Direct heating does not lend itself very readily to the vacuum distillation and fractionation of mineral oils. Because of the fact of a low co-efficient of heat transfer, it is necessary to use high temperature differences in order to get any sort of an output. The use of these high temperature differences generally results in comparatively low flash and fire points, which it has been the aim of all manufacturers to avoid.

"The use of indirect heating permits of use of design that results in fairly high coefficient of heat transfer and therefore permits of relatively low temperature differences.

"Up to the present time the indirect methods of heating have been circulation of fusible metals in a molten state, mercury in a vapor state, sulphur in a vapor state, and the subject of the present paper 'diphenyl' in a vapor state.

"In the choice of a medium for indirect heating, the material used must be reasonably cheap, must be very easily and readily handled, must be safe as regards pressure at the temperature used, and must be capable of being continuously used without decomposition.

"In fractional distillation of mineral oils under

vacuum, in the production of lubricating fractions, the temperature ranges are from approximately an initial boiling point of 485° to a final boiling point of 625°, the temperature as given being that of the vapor under an absolute pressure of approximately five millimeters.

"Diphenyl at the temperature of 750° has a pressure of approximately 110 pounds gauge pressure, which is not excessive as regards strain at the temperature used, and can be readily handled in an apparatus of standard type and construction.

"Diphenyl, up to its critical temperature of approximately 913°, does not undergo decomposition, provided no portions of the mass are heated appreciably above this point; and diphenyl, heated to this point for a considerable period of time by means of a lead bath, maintained at a temperature slightly in excess of such critical temperature, has suffered no decomposition or breakdown.

"Diphenyl, under conditions of practical use, wherein the diphenyl was maintained at a temperature of 750° — the sensible and latent heat being supplied to the diphenyl by means of products of combustion flowing around the outside of tubes while the diphenyl was circulated through the tubes at a velocity of approximately 11 feet a second, suffered no breakdown or decomposition over an extended period of use. This uninterrupted service lasting over a period of approximately six months without change in the diphenyl used and with no addition thereto for makeup.

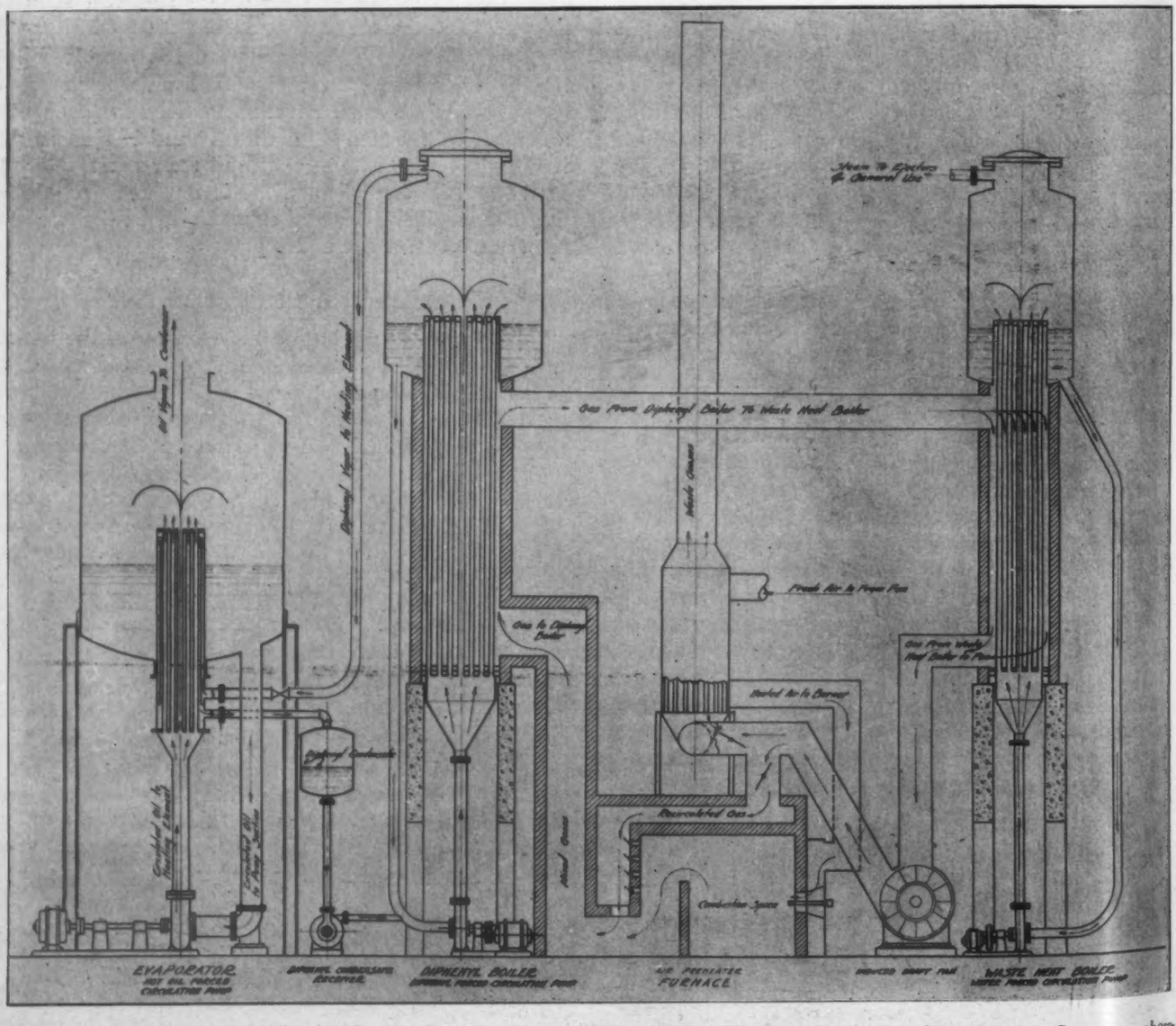
"Diphenyl has a melting point of approximately 158°; a boiling point of approximately 484°; a vapor pressure of approximately 110 pounds at 750°; a specific heat of approximately .4 at 750°; and a latent heat of vaporization of approximately 110 B.t.u.'s at this temperature

NOT CORROSIVE

"Diphenyl is not corrosive, is combustible but not inflammable, and does not attack, neither is it attacked by, any of the ordinary metals as used in the fabrication of distilling and exaporating apparatus.

"In illustrating its use, advantage has been taken of the so-called 'scene-in-action' method, which illustrates more fully than slides could possible illustrate the use of diphenyl as a heat transfer medium in vacuum distillation.

"In the apparatus as actually used, it is, of course,



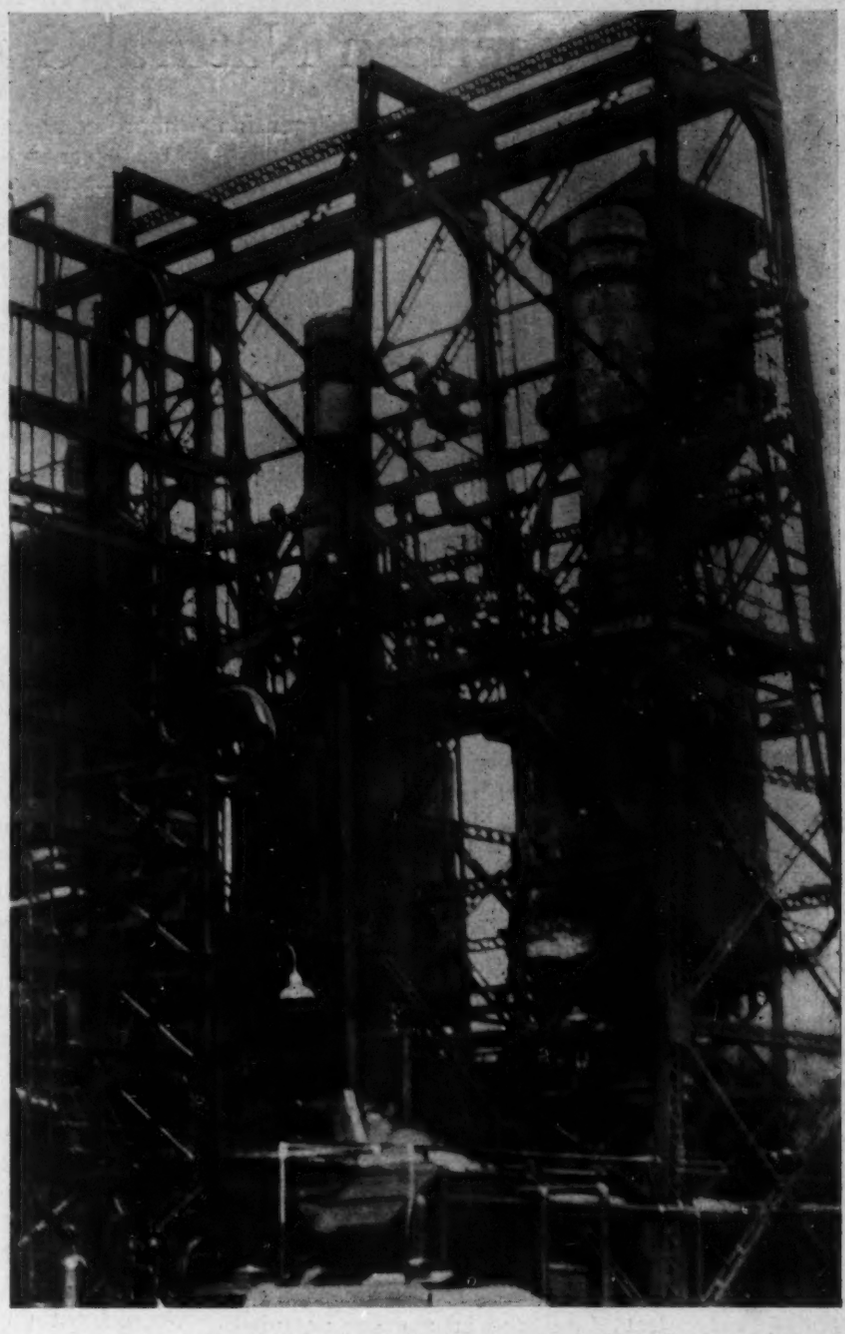
Flow chart of one unit of the Govers Process developed at the Lawrenceville, Illinois refinery of Indian Refining Company, showing the method of utilizing diphenyl as an indirect heating medium. The oil, gas, water and steam circuits are also shown. Steam for operation of pumps is generated in a waste heat boiler

understood that all parts of the apparatus which are heated or supply heat are thoroughly insulated, and all pipes and parts of the apparatus used for the conveyance or transfer of diphenyl are either steam-jacketed or wrapped with steam pipes to allow of the liquefaction of diphenyl, in order to permit of its being pumped and circulated in starting up the apparatus.

"Also, in the apparatus in use, the flue gases are re-circulated for economy and the air delivered to the burner is preheated and the waste heat gases robbed of part of their heat before going to the stack. This is not shown on the illustration, but is a matter of installation and will be quite obvious to engineers.

"Referring to the illustration, we will take up first the diphenyl boiler; as this is, of course, the principal subject matter of the paper.

"The diphenyl boiler comprises two tube sheets connected by means of tubes, the tubes being enclosed by an insulated duct. In the diphenyl vapor generator in use there are 260 tubes each 26.6 feet long, having a total of 2800 square feet of heated surface. The upper tube sheet is part of the vapor drum and the lower tube sheet is provided with a cone, this cone being part of the circulating system which comprises the pipes leading from the cone to the circulating pump and from the vapor drum to the circulating pump. The heat is supplied to the outside of the tubes by products of combustion from the furnace, these products of combustion being moved by means of fans not shown on the illustration.



Partial view of primary unit of the Gover Process for lubricating oil manufacture, showing two of the vacuum evaporator units

"The vapor from the diphenyl is taken off from the top of the drum into the space surrounding the tubes in the evaporator, gives up its heat to the mineral oil being circulated through the tubes of the evaporators, is condensed, flows into the receiver, thence into the return pump, from which it is forced back into the diphenyl circulating system and revaporized.

"The circulating system on the evaporator is very much the same in principle as that of the diphenyl boiler. There is simply a slight difference in design, the principle, however, of evaporation while under forced circulation being retained. The vacuum pan and condenser are under diminished pressure of approximately 5 mm. absolute.

"The vaporized mineral oil is carried off up through the central tube, expands around the condenser tubes, is condensed and discharged by the barometric discharge pipe, falls into the receiver and is then transferred by the pumps into any storage tank desired.

"The condensing water is furnished from the plant system and provision made by means of a water tower for any temporary failure of the water supply.

"In order to get a good heat transfer from the products of combustion through the diphenyl, fairly high temperature differences are used, the hot gases leaving the top of the diphenyl boiler at approximately 1000°. Use is made of these hot gases to furnish heat for a waste heat boiler, which, in the present case, works out very economically, since high pressure steam is desired for the use of ejectors used on the vacuum pans or evaporators.

"The waste heat comes from the top of the diphenyl boiler down and around the tubes in the wast heat

(*Continued on page* 80)

South American Natural Gasoline Industry

VENEZUELA, Colombia, Peru, and Argentina have an aggregate production of around 175,000 gallons of natural gasoline per day; but the extraction of gasoline from casinghead gas has not kept pace with crude oil production in South American countries. The question of whether the vast oil fields on the eastern shore of Maracaibo Lake will be operated by gas lift or other means will have a bearing on plans for the installation of compression and absorption equipment. Engineers are studying the problem intensively at Maracaibo and elsewhere, and it is predicted that some very important installations will be made within the next year or two.

The largest gasoline plant in Venezuela is located in the Mene Grande Field, owned by Caribbean Petroleum Company (Shell). It is of the compression type, and contains twenty-six 500-cubic foot compressors powered by 185 horsepower gas engines, all manufactured by Thomassen Machine & Motorenfabriek, of Holland. With the exception of the pressure gauges, which were manufactured by well-known American firms, all of the equipment in the plant is of European origin. The plant has a capacity of around 20,000,000 cubic feet of raw gas and a maximum yield of about 30,000 gallons of gasoline per day, although the current restriction of crude oil production has materially reduced the volume of gas available. The Caribbean also operates two 3,000,000 cubic foot absorption plants, which have an output of around 2000 gallons of gasoline per day. This absorption equipment is of American manufacture, the condensers and rectifiers being made by Braun and the stills by Southwestern Engineering Company.

American equipment is utilized almost exclusively in the British Controlled Oilfields plant at El Mene, which consists of fourteen 12-inch bore by 14-inch stroke Ingersoll-Rand compressors powered by 125 horsepower Waukesha motors. It has a capacity of 6,5000,000 cubic feet of gas and an average net yield of around 12,000 gallons of gasoline per day. Arrangements have been made for the addition of eight more compressors, which is expected to increase the total plant yield to about 20,000 gallons per day.

Venezuelan Oil Concessions, Ltd. (Shell) operates two Braun units in the lake-shore fields; and it is said that company engineers have drawn plans for the construction of a very large plant, which doubtless will be built at Lagunillas.

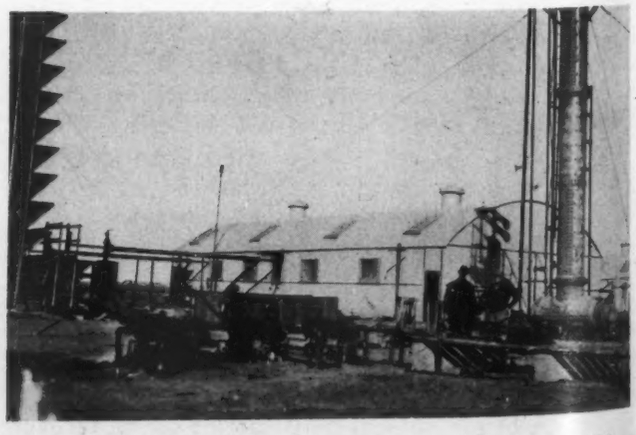
The Lago Petroleum Company (Standard Oil Company of Indiana) is building a 15,000,000 cubic foot plant at La Salina, in the La Rosa Field; and the Venezuela Gulf Oil Company is also said to be figuring on the erection of two large plants at La Rosa and Lagunillas.

Tropical Oil Company operates two Braun plants at El Centro, Colombia, which produce around 41,000 gallons of gasoline per day; and its parent company, International Petroleum, owns four compression and two Braun absorption plants at Talara, Peru, which have a combined average production of approximately 80,000 gallons per day. Ingersoll-Rand and Bessemer compressors and gas engines are used in all of these plants.

There are only five gasoline plants in Argentina, all of which utilize American equipment. *The Compani Ferrocarrilera de Petroleo,* owned by British Railway interests, operates a 750-gallon combination compression and absorption system at Camodoro Rivadavia; and the *Yacimientos Petroliferos Fiscales,* Government oil production agency—operates a 1500-gallon compression plant in the same field. A third plant having a capacity of about 375 gallons per day is operated by Anglo Persian Oil Company.

The Standard Oil Company of Argentina has just completed the installation of three 165 horsepower Bessemer units at Plaza Huincul, which are expected to have an output of about 2000 gallons of gasoline per day. A similar plant has been erected at Lomitos, the company's new field near Tartagal, in northern Argentina. Both of these new plants were built under the supervision of W. H. Cooper of the Hope Natural Gas Company of Parkersburg, West Virginia.

Braun gasoline absorption plant of the Tropical Oil Company at El Centro, Colombia



Standard Oil Company's new gasoline plant, located at Plaza Huincul, Argentine

Refining Industry Has Fertile Field in South America

By ROY E. LEIGH

ALTHOUGH two refineries which rank among the larger plants of the world are located at Curacao and Aruba, small Dutch islands situated in the Caribbean Sea about 60 miles north of the Venezuelan coast, refining is still classed among the infant industries elsewhere in South America. The reasons for this industrial backwardness on the part of the Latin American republics are both political and economic. Political because, in certain instances, refinery construction has actively been opposed by governing officials; and, in other cases, refining interests have hesitated to assume the risk of making large plant investments in countries with unstable governments. Enocomic because the meager demand for gasoline, motor oils, and industrial lubricants has, until very recently, been adequately supplied from North American, European, and West Indian sources.

However, South American people are acquiring a belated interest in automotive and aeroplane transportation; and certain countries, notably Argentina and Venezuela, are beginning the construction of comprehensive highway systems. Now that a definite start has been made on the great task of highway building, it is believed that other South American countries will be much more eager and alert to emulate their more progressive neighbors than they have been to follow the example of the United States. Thus, the handwriting on the wall spells out a message which indicates in no uncertain terms that the next decade may bring about a large increase in South American refining operations.

BRITISH TAKE LEAD

British refiners must be credited with having foreseen the possibilities of Caribbean and South American markets sooner than did their American competitors. At least, they were quicker to install plants at strategic points from which to control the growing markets. Royal Dutch Shell and other British companies have been firmly entrenched in Trinidad, Curacao, and Venezuela for a number of years; but American investments in those quarters have been made only recently.

Tropical Oil Company and International Petroleum Company, subsidiaries of the Imperial Oil Company of Canada, have had the West Coast situation well in hand for several years through the operation of refineries at Barranca Bermeja, Colombia, and Talara, Peru; but it was not until this year that Standard Oil Company of Indiana built its large plant at Aruba, D. W. I., and that the Standard Oil Company of New Jersey constructed its two small plants at Brighton, Trinidad, and Maracaibo, Venezuela. The New Jersey company's plants, which have capacities of only about 3000 barrels each, are probably not more than entering wedges or nuclei for larger refining bases to be installed later; but the Indiana company's plant, which includes both topping and (Cross) cracking stills, has a total capacity of from 80,000 to 100,000 barrels per day and is capable of turning out refined products in sufficient volume to become a factor in world markets.

LARGEST SOUTH AMERICAN PLANT

The largest refinery in all South America is that owned by Curacaosche Petroleum Industrie Maatschappij, a Shell subsidiary, at Curacao, Dutch West Indies, which has a capacity of around 140,000 barrels of crude per day. Arend Petroleum Maatschappij, another Shell subsidiary, operates a smaller plant at Aruba, which has a capacity of around 14,000 barrels per day. Oil for these plants is supplied by a fleet of 36 shallow-draft tankers having an average capacity of 14,000 to 15,000 barrels each, which ply back and forth between these ports and the several oil fields of the Maracaibo Basin. A study of port statistics shows that the products of these plants are shipped all over the world—to Holland, England, Germany, France, Belgium, Portugal, and Italy; and to such remote points as Gibraltar, Egypt, and the Canary Islands. These plants, in association with the United British and Trinidad Leaseholds refineries at Trinidad, B. W. I., supply the Shell's trade in the West Indies and on the east coast of South America, leaving the West Coast to be supplied from California and Mexico.

TRINIDAD

The refining industry of Trinidad, which is one of the most important units of the British Empire, insofar as petroleum is concerned, is of far greater potential importance than the crude oil production of the Colony (now averaging around 25,000 barrels per per day) would seem to indicate. Sir Thomas H. Holland, formerly Minister for Commerce, Industries, and Railways in Lord Chelmsford's government of India, and author of the petroleum regulations of the Indian Empire, who made an investigation of the colony's oil industry during 1928, recognized Trinidad's strategic position with respect to the actual and potential oil fields of eastern Venezuela and recommended that the tariff on crude oil be abolished, with a view to encouraging the establishment of plants for refining oil produced under less favorable political conditions.

There are five different refining plants on the island of Trinidad, of which only three are of importance in the export trade. The two smaller plants referred to are owned by Trinidad Lake Asphalt Operating Com-

Tropical Oil Company's refinery near Barranca Bermeja, Colombia

Caribbean Petroleum Company's topping plant, San Lorenzo, Venezuela

pany, which produces only gasoline for field operations and fuel oil, road oil, and flux oil for use in connection with its asphalt operations, and Trinidad Central Oilfields, Ltd., whose sales activities are limited to Trinidad, British Guiana, and other British possessions in Caribbean waters. The Asphalt company's refinery has a capacity of around 1100 barrels per day, and the plant of Trinidad Central Oilfields is about half that large.

Trinidad Leaseholds, Ltd., operates the largest plant on the island, which has a crude capacity of from 17,500 to 20,000 barrels per day. It consists of two topping plants, re-run stills, and a number of Dubbs cracking units, to which additions are still being made from time to time. Normally, Leaseholds uses crude produced and purchased within the colony, but several test-runs have been made on oil imported from Maracaibo. Gasoline is shipped in cargo lots to distributors situated in the British Isles, along the Atlantic seaboard of the United States, and in Porto Rico and other West Indian islands. Local distribution of refined products is handled through New Trinidad Petroleum Warehouses, Ltd., of Port of Spain, commonly known as the "Gasoline Pool," which is controlled by the Royal Dutch Shell.

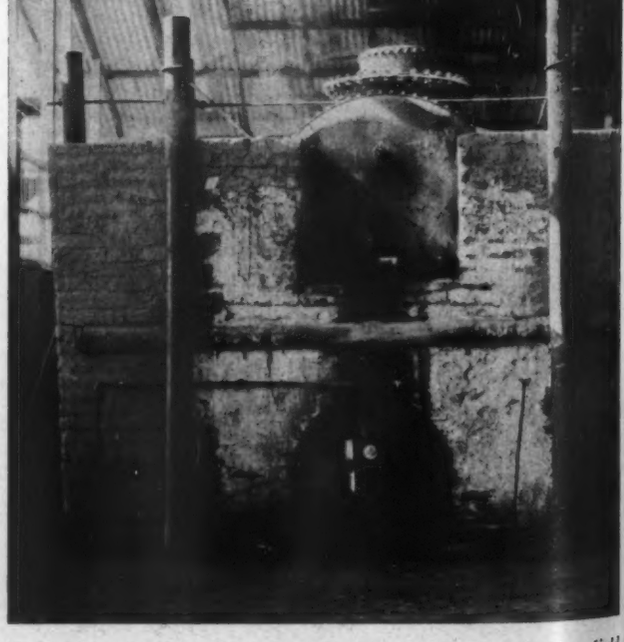
United British Oilfields of Trinidad, which owns a 2500-barrel topping plant at Point Fortin, is also closely allied with the Shell group. Its fuel oil is sold to the British Admiralty, and its light products are marketed through the "Gasoline Pool." Since the recent development of a new source of deep production in the Parry Lands Field, near Point Fortin, it is said that plans for an increase in plant capacity are under consideration.

NEW JERSEY ENTERS CARIBBEAN MARKET

West India Oil Company (Standard Oil Company of New Jersey) has just completed and put into operation a small topping plant of around 3000 barrels capacity at Point D'Or, near Brighton and Pitch Lake, which will handle crude produced by Trinidad Oil Fields Operating Company, the New Jersey company's producing subsidiary. The construction of this and a similar plant by the same company at Maracaibo represents a further effort on the part of the Standard Oil Company of New Jersey to expand and strengthen its position in the Caribbean markets, and it may have a very important bearing on future competition between Shell and Standard interests. The Trinidad plant gives the American company a position inside the British Preferential Tariff wall and, for the first time, allows it to compete on equal terms with the Shell companies in Trinidad, the Guianas, Barbados, Jamaica, and other British possessions. Likewise, the new plant at Maracaibo will give the Standard a toe-hold in the Venezuelan market, heretofore monopolized by the Caribbean Petroleum Company (Shell), whose San Lorenzo plant is protected by Venezuelan tariffs.

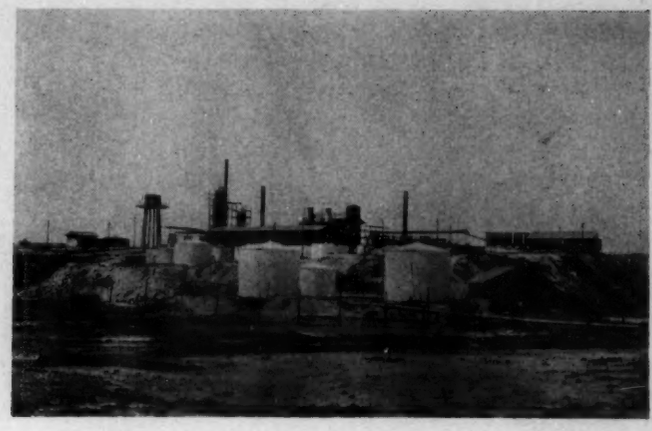
It has been suggested that the Trinidad plant may be the nucleus of a large refining base ultimately intended to handle oil from the new Quirequire field near Maturin, in eastern Venezuela, which is now being brought into production by the construction of a 28-mile pipe line from the new field to deep water on the San Juan River.

West India Oil Company's Maracaibo plant is expected to refine royalty oil produced from the Maritime Zone, owned by the Creole Petroleum Company (for-



One of the Ecuador Oilfield's three tea-pot stills, Cautivo field, Ecuador

Yacimientos Petroliferos, tanks, refinery and wharf at Comodoro Rivadavia, Argentine



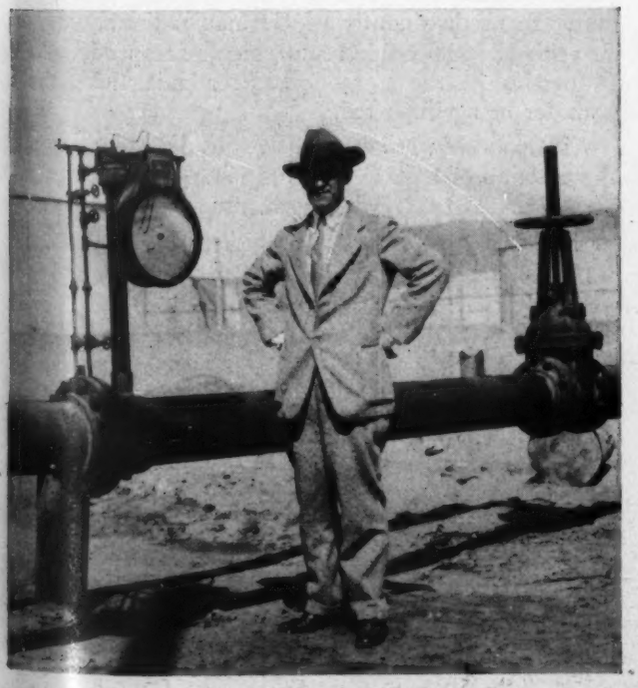
Anglo-Ecuadorean Oilfields' at Puerto Rico. This is on the Ecuadorean coast

merly Standard Oil Company of Venezuela) and subleased to Venezuela Gulf Oil Company. Presumably, it will also handle other oils to be produced by Creole from its potentially valuable acreage at Totumo (Rio Palmar), Urumaco, Dabajuro, and elsewhere in western Venezuela.

REFINING LAGS IN VENEZUELA

Refining operations in Venezuela lag far behind the country's crude oil production, which now averages around 375,000 barrels per day and is second only to that of the United States. This, of course, is due in part to the fact that the Shell and Standard Oil Company of Indiana have deemed it advisable to construct their large plants under the protection of the Dutch flag.

Prior to the building of West India Oil Company's new plant at Maracaibo, the only plant of any importance was that owned by Caribbean Petroleum Company (Shell) at San Lorenzo, on the eastern shore of Maracaibo Lake. This Trumble topping plant of about 15,000 barrels daily capacity supplies about 80 per cent of Venezuela's gasoline requirements, which average around 55,000 gallons per day. The operation of this local plant heretofore gave the Shell subsidiary a practical monopoly of the Venezuelan trade, as duties of $10.05 per ton on gasoline, $53.00 per ton on kerosene, and 37 cents per Imperial gallon on lubricating oil are levied on all imported products. In addition, gasoline produced in the West Indies, as, for example at the Shell plant at Curacao, is subject to a discriminatory surcharge of 33-1/3 per cent.



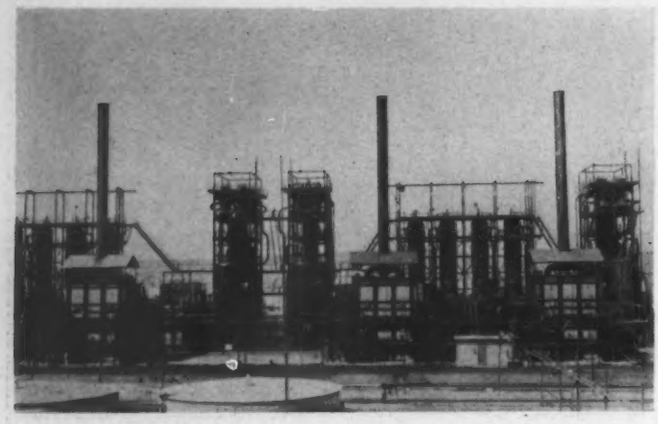
R. H. Ebbetts, assistant superintendent, Talara refinery, International Petroleum Company—operating in Peru

Both the Lago and Gulf companies have small topping plants at La Rosa, on the Maracaibo lake-shore, the chief purposes of which are to supply gasoline, bunker oil, etc., for use in field operations and for fueling the shallow-draft tankers. The Lago plant is of about 2500 barrels daily capacity, and the Gulf plant handles around 2000 barrels of crude per day.

The Magdalena River valley and the interior markets of Colombia are supplied almost wholly from the Tropical Oil Company's 10,000-barrel overhead distillation plant at Barranca Bermeja, on the Magdalena River and near the El Centro oil field. Tropical Oil Company's marketing operations cover all of Colombia except for the eastern section along the Venezuelan frontier, where transportation facilities favor the Shell. The coast trade, centering around Buenaventura, Tumaco, and Santa Marta is supplied by importations from Peru and California.

The very means by which refined products are transported in Colombia indicate the limitations of the market. Gasoline, kerosene, and lubricating oils are shipped in cases and drums up and down the Magdalena in company-owned and independent river boats; by small coastal vessels of every description; by rail, where railroads are available; by motor trucks, where highways are passable; by cable-ways over the mountain ranges; and by pack-mules where faster means are not to be had.

Tropical Oil Company, International Petroleum Company, and West India Oil Company practically dominate the West Coast market, from Panama to Cape Horn. Presumably, the bulk of their products originate at the International Petroleum Company's 15,000-barrel refinery at Talara, Peru. Small quantities distributed in Ecuador are purchased from Ecuador Oilfields, Ltd., which operates three small topping stills with a throughput of around 80 barrels per day at Puerto Rico, near Las Salinas, on the Ancon or Santa Elena Peninsular. The Ecuadorian market is divided between the West India Oil Company and the *Sociedad Comercial Anglo-*



International Petroleum Company property at Talara, Peru

Ecuatoriana, which distributes gasoline, kerosene, Diesel oil, and fuel oil from the Anglo-Ecuadorian Oilfields Company's 400-barrel refinery at La Libertad, near the Santa Elena Field.

Refining operations in Bolivia are restricted to a couple of small "tea-pot" stills situated at Sanandita and operated by Standard Oil Company of Bolivia for the sole purpose of supplying gasoline and fuel oil for motor transport and drilling operations.

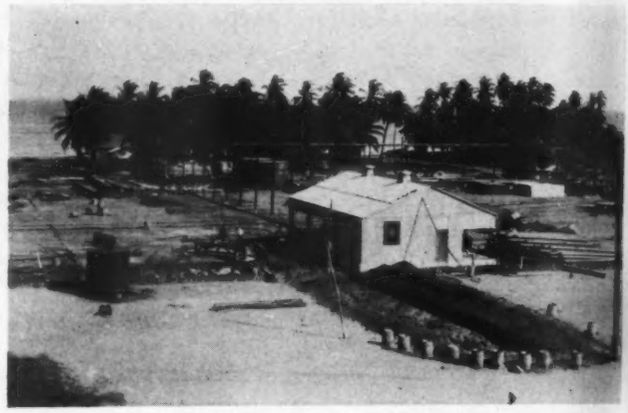
ARGENTINA

There are 19 different refining plants in the Republic of Argentina, of which only five have capacities exceeding 2500 barrels per day, and 12 are of less than 500 barrels daily capacity. The largest of these is owned by the Argentine government and is situated at La Plata. It has a capacity of about 15,000 barrels per day, and is operated on crude produced by the *Yacimientos Petroliferos Fiscales* (government oil agency) at Comodoro Rivadavia and Plaza Huincul. In addition, the Y. P. F. also operates two other refineries, a 2000-barrel plant located in the Comodoro Rivadavia field, and a 1000-barrel plant at Plaza Huincul. All three are combination topping and cracking plants.

Standard Oil Company of New Jersey, through its subsidiary, *Compania Nacional de Petroleos,* operates two refining and cracking plants at Campana and Bahia Blanca, in southern Argentina, and a small topping plant at Embarcacion, near the Bolivian frontier. The Campana plant is of about 8000 barrels capacity, and operates on crude imported from the United States and Peru. The plant at Bahia Blanca, which has a daily capacity of around 1600 barrels, is operating on crude produced from the Plaza Huincul field near the Chilean border, about 700 miles southwest from Buenos Aires and 550 miles northwest from Comodoro Rivadavia.

Compania Ferrocarrilera de Petroleo (Railway Oil Company), which is owned jointly by the (British) Western, Pacific, and Southern railway companies, has about 3800 barrels of daily production in the Comodoro Rivadavia field, all of which is refined at that point for the primary purpose of supplying locomotive fuel. All of the company's gasoline production is turned over to the Y. P. F. for distribution through government-owned bulk and filling stations. The plant includes topping stills, a complete refinery, and Cross cracking units.

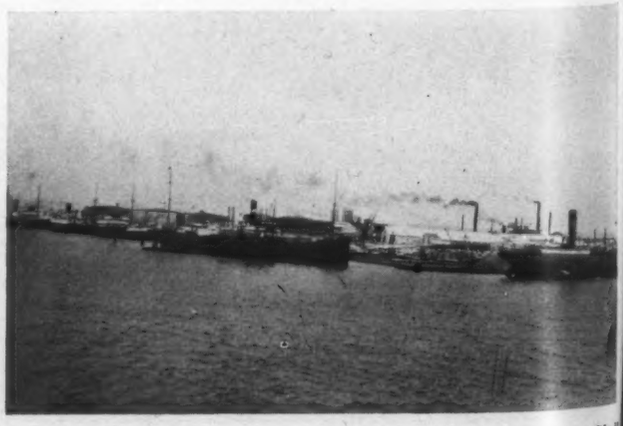
Itaca Compania Argentina operates a 3500-barrel topping and refining plant and is building a 1000-barrel Cross cracking plant at Campana. This is a subsidiary of the *"Astra" Compania Argentina de Petroleo,* which although the majority of its capital stock is held in Argentine, is generally referred to as a German company, by reason of the fact that its management and staff are predominantly of German nationality. About two-thirds of its crude requirements are produced from properties in the Comodoro Rivadavia field, the remainder being imported.



West India Oil Company's 3000-barrel topping plant under construction at Areaga, near Maracaibo, Venezuela

Diadema Argentina, a Shell subsidiary, contemplates the erection of a 5000-barrel topping and cracking plant at Buenos Aires, if/when governmental sanction can be

A more advanced form of "pipe-lining" in Ecuador. Hauling crude oil in burro drawn drums helps the roads, too

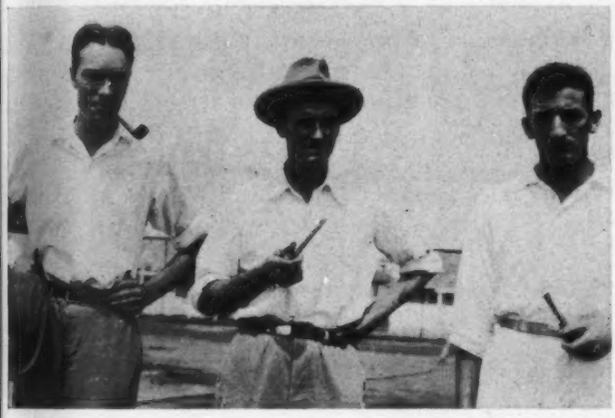


Curacaosche Petroleum Industrie Maatschappij refinery, a Shell property at Curacao, Dutch West Indies

secured. Application for a permit was filled more than a year ago, but no official action has yet been taken. Meanwhile, production operations have been suspended, as the company has no outlet for its oil.

Presumably, official action has been deferred pending the outcome of a nationalization project now before the Argentine senate, on the theory that, if the refinery should be commenced or erected prior to the passage of the nationalization bill, the government would have to purchase or take it over by other means shortly thereafter. Other important petroleum projects in Argentina are also being retarded, doubtless for the same reason.

Argentina, which imports about 58 per cent of her gasoline and fuel oil requirements and about 38 per cent of her supplies of kerosene and other petroleum products, offers a most fertile field for refinery expansion, since demands for petroleum products are increasing year by year with the growth and development of the country. However, so long as Argentine politicians continue to flirt with the scheme to nationalize the petroleum industry, there will probably be no new investments made in refinery equipment.



Left to right: E. F. Brennand, chief engineer; G. W. Roberts, superintendent; E. L. Saville, chief accountant, all with Caribbean Petroleum Company, San Lorenzo refinery, Venezuela

Although the South American continent produces more than one-half million barrels of oil per day, only about one-half of one per cent. of that total is refined by local enterprise. There are a number of crude or obsolete plants in Argentina which are owned and operated by local people; but they are of no economic importance, even in the domestic market. There is a small still near Rubio, in the southwest corner of the State of Tachira, Venezuela, which has been operated since 1878 on crude produced from pits dug by hand around a nearby seepage. There is little demand for gasoline in this remote section, but the plant's kerosene production finds a ready sale in the native huts of the community. Two or three small "tea-pot" refineries in the Cautivo field, near Las Salinas or Santa Elena, on the coast of Ecuador, are of more interest as curiosities than for their economic importance. Were it not for the fact that "grass-root" or shallow production affords a source of crude within reach of native intelligence, these plants probably never would have come into being. Only the wide spread between the local cost of gasoline and the low value of the *cholo's* labor enables these Ecuadorian refiners to continue to operate in competition with the modern British-owned plant nearby.

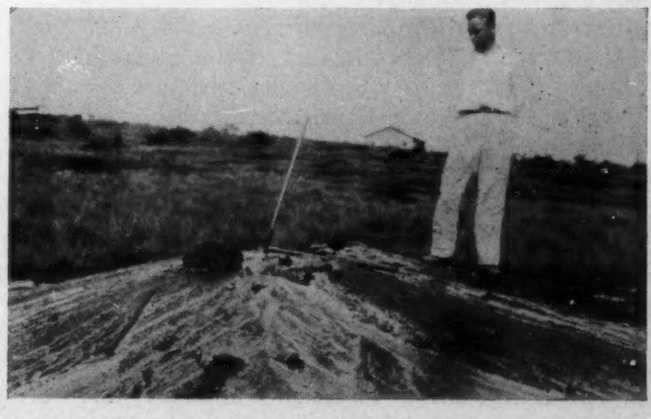
Seaward view of Ecuador Oilfields' refinery and camp at Cautivo, Ecuador

SHIPMENT IN PACKAGES

With the exception of the metropolitan area of Buenos Aires, practically all of the refined products consumed in South American countries are packed and shipped in cases and cans. Thus, it is necessary for all the larger refiners to operate case and can plants in addition to their stills.

It is probably true that 90 per cent. of shipments are handled by at least three modes of transport before reaching their destination. A representative shipment originating at the Tropical Oil Company's plant at Barranca Bermeja, Colombia, would move by stern-wheel steamer up the Magdalena River to La Dorado, thence by rail to Mariquita, and then by aerial cable-way over the mountains to Manizales, to reach its ultimate destination by pack-train. Another shipment might be routed down-river to Barranquilla, thence by rail to Puerto Colombia, on the Caribbean Sea, to be forwarded by small steamer or sailing sloop to another coastal port, there to be transferred to *cayucas* (canoes dug out of single logs) for the last leg of its journey to some remote interior point.

Distribution in Buenos Aires is handled by methods similar to that used in North America, save that curb pumps are only now beginning to give way to drive-in filling stations. Supplies for interior bulk stations are shipped from refineries and docks in railway tank cars; and are re-packed in drums and cases for retail in the more remote towns and villages.



H. A. McDonald, assistant superintendent, Caribbean Petroleum Company, inspecting seepage of oil and asphalt at Mene Grande, Venezuela

Scientific Phase of Exposition Holds Interest of Manufacturing Division of Industry

TO the manufacturing division of the petroleum industry the foremost attraction of the sixth International Petroleum Exposition and Congress at Tulsa will be the Scientific Building. Some of the equipment and methods of that building will be of commercial nature, while others will be the result of co-operative activity of organizations. This scientific display will not be devoted wholly to manufacturing but the several exhibits pertaining to manufacturing will be extremely interesting.

The exposition opens October 5 and will close October 12. The grounds and plant, with improvements, where shows have been held southwest of the city in past years, will be used again. One improvement for 1929 is the addition of the auditorium, which adjoins the Technical Building. In this, different organizations will hold meetings during the exposition. It will be equipped for scientific lectures.

The Bureau of Mines has collected the numerous products available from natural gas and will have them on display in the Scientific Building. This will be the first time so many of the products of this resource ever have been put in one display.

A series of lectures on petroleum technology by Professor C. M. Smith of the Oklahoma A. & M. College is another attraction for the Scientific Building. These lectures will deal with many phases of manufacturing in the petroleum industry.

Equipment to be seen in the scientific displays will include the consistometer, thermoviscometer, A. S. T. M. float test apparatus, penetrometer, apparatus for determining the consistency of greases and petrolatum, vapor pressure bombs, steam heated viscometer, spectrum analysis of gasoline apparatus.

SAFETY CONTEST

A meeting of the directors of the Western Petroleum Refiners Association is scheduled during the exposition.

A new venture for the exposition will prove of interest to executives of the refining industry. This will be the program for jobbers, the afternoon of October 11. R. R. Irwin, president of White Eagle Oil & Refining Company of Kansas City, will preside at this meeting, which will be devoted to a consideration of the National Code of Marketing Practices. H. B. Earhart, president of White Star Refining Company of Detroit, will be the speaker on this program. The program will be the first ever held for jobbers at the exposition. The new auditorium will be used.

Many refining concerns are to take advantage of the coming jobbers to have them later visit refining centers in the Mid-Continent.

The annual safety contest, sponsored by the Safety Section of the Mid-Continent Oil & Gas Association, the United States Bureau of Mines and the National Safety Council, will draw many entries from refining plants and natural gasoline plants. There will be more than 30 teams entered and the majority will come from the manufacturing division of the industry.

The contest will be held the afternoon of October 1 at the exposition grounds. That night the banquet will be held, when awards will be made.

An event of interest to the whole petroleum industry will be the Exposition Golf Tournament. Qualifying rounds will be played October 7. Match play in each flight will begin the following day, with championship matches to come October 10. The exposition cup, now held by Walter Critchlow of Ardmore, Oklahoma, will be awarded the tournament winner. There will be prizes for both winners and runners-up in each flight.

The golf tournament committee is headed by Frank Gray of Prairie Oil & Gas Company. Other members are F. Lee Kennedy, John M. Risk, A. M. Bowman, Hal C. Moore, A. E. Bradshaw, D. B. Mason and C. F. Camp.

The scientific committee has C. V. Milliken, Amerada Petroleum Corporation, chairman; W. K. Whiteford, Barnsdall Refineries, Inc.; W. A. Schlueter, Refinery Supply Company; Kent Kimball, petroleum geologist; J. R. McWilliams, Skelly Oil Company; R. S. Kappan, petroleum engineer; C. D. Watson, Carter Oil Company; K. C. Sclater, petroleum engineer; Dr. C. K. Francis, Oil & Gas Journal; W. A. Sawdon, oil field engineering; R. R. Brandenthaler, United States Bureau of Mines; D. Hawkins, petroleum engineer; R. C. Beckstrom, Tulsa University; R. S. McFarland, Sun Ray Oil Company; Lawrence E. Smith, National Petroleum News; Grady Triplett, Refiner and Natural Gasoline Manufacturer; F. E. Kearney, Mid-Continent Petroleum Corporation; W. G. Heltzel, Sinclair Pipe Line Company.

AVIATION

Another event of general interest will be the aviation exhibit and the demonstration of aircraft. The "on to Tulsa" air derby will end at the exposition grounds October 5. Airplanes entered will be from the oil industry. Each must start at a point at least 500 miles from Tulsa and finish at the grounds between 11 o'clock and 6 o'clock, October 5.

Following the derby will be closed course races, bombing demonstrations, aerial fireworks and other events on the aviation field throughout the exposition dates. There will be army, navy and civilian airplanes in these events, with many of the commercial airplanes out of the ranks of those owned and used by oil companies.

Prominent among the commercial exhibits will be those of refining concerns of the Mid-Continent area. These companies have placed displays of their finished products. There will be equipment to depict manufacturing methods in refining.

MEN WHO MAKE THE EXPOSITION

1—W. G. Skelly, president, president Skelly Oil Company. 2—Frank J. Hinderliter, vice president, president Hinderliter Tool Company. 3—Alf G. Heggem, vice president, president Oil Well Improvements Company. 4—A. W. Leonard, treasurer, general manager Devonian Oil Company. 5—William Holden, secretary, secretary Tulsa Chamber of Commerce. Directors: 7—Clyde Alexander, vice president, Phillips Petroleum Company. 8—A. A. Beard, oil producer. 9—F. R. Billingslea, oil producer. 10—A. F. Bourne, Oklahoma Iron Works. 11—N. M. Bovaird, Bovaird Supply Company. 12—J. H. Brooks, Republic Supply Company. 13—O. T. Dawson, National Supply Company. 14.—R. E. Day, Magneto Ignition Corporation. 15—C. P. Dimit, Gypsy Oil Company. 16—R. L. Dudley, Gulf Publishing Company. 17—George A. Dye, H. F. Wilcox Oil & Gas Company. 18—John M. Egan, Petroleum Publishing Company. 19—J. P. Flanagan, oil producer. 20—H. V. Foster, Indian Territory Illuminating Oil Company. 21—Jacob France, Mid-Continent Petroleum Corporation. 22—Robert F. Garland, oil producer. 23—J. Burr Gibbons, Oil Well Improvements Company. 24—Walter Gray, Jarecki Supply Company. 25—Henry Greis, oil producer. 26—R. A. Griffith, Sinclair Oil & Gas Company. 27—Brooks Gutelius, Continental Supply Company. 28—P. D. Hayes, Exchange National Bank.

MEN WHO MAKE THE EXPOSITION

6—W. B. Way, general manager. Directors: 29—J. M. Hayner, oil producer. 30—B. E. Horrigan, oil producer. 31—Fred W. Insull, Oklahoma Public Service Company. 32—Joe McGraw, McGraw Oil Company. 33—D. F. McMahon, oil producer. 34—Walter Miller, Continental Oil Company. 35—Harry J. Morlang, oil producer. 36—E. J. Nicklos, Continental Oil Company. 37—Clyde Pape, Selby Oil & Gas Company. 38—J. Edgar Pew, Sun Oil Company. 39—Waite Phillips, Independent Oil & Gas Company. 40—Warren C. Platt, National Petroleum News. 41—J. M. Post, Oil Well Supply Company. 42—Ralph B. Pringle, Independent Oil & Gas Company. 43—E. B. Reeser, Barnsdall Oil Corporation. 44—Harry H. Rogers, Exchange National Bank. 45—J. H. Satterwhite, Westcott & Greis. 46—W. A. Schlueter, Refinery Supply Company. 47—R. C. Sharp, oil producer. 48—J. S. Sidwell, Prairie Oil & Gas Company. 49—Harry H. Smith, Mid-Continent Oil & Gas Association. 50—Victor H. Smith, Gulf States Terminal & Transport Company. 51—O. C. Staples, Frick-Reid Supply Company. 52—D. D. Wertzberger, Wertzberger Derrick Company. 53—T. R. Weymouth, Oklahoma Natural Gas Company. 54—R. M. Young, Carter Oil Company.

East Coast Logical Field for Future Refinery Expansion

By H. J. STRUTH
Staff Economist

ANY consideration of the future of the petroleum industry must contemplate expansion of refining facilities to satisfy the growing world-wide demand for motor fuel. While it has been said, time after time, that refining capacity in the United States is already in excess of normal requirements, it is, nevertheless, a fact that the field is not overcrowded in a number of strategic areas. When we consider the fact that the Middle Atlantic and New England divisions of the Atlantic Coast are really inadequately equipped with sufficient refining capacity to supply their own immediate requirements, to say nothing of the constantly growing European demand, it becomes apparent that this area is a logical field for future refinery expansion. Further, the fact that New York is the terminus of tankers plying between crude shipping ports of the world, particularly from South America and the Pacific and Gulf Coasts of the United States, makes it evident that refinery expansion efforts of the future will undoubtedly be concentrated within this important manufacturing and marketing area.

DEMAND EXCEEDS OUTPUT

Statistics covering the actual marketed production and consumption of the Middle Atlantic and New England area, for the first seven months of 1929, reveal that demand, domestic consumption plus exports, exceeded marketed output of refineries within this territory by 12,223,000 barrels. The accompanying map shows the status of the states comprising this division; the solid figures representing marketed production, while the outline figures indicate actual consumption in millions of barrels. As a matter of fact, if we include the entire Atlantic Coast, from Maine to Florida, the deficit between supply and demand amounts to 26,308,000 barrels for the period covered. Naturally, this deficiency of supply must be obtained from other sections of the United States. In fact, more than the difference shown is being supplied by California and Texas, as well as Venezuela. Points at which refineries are located in this area are designated by black dots on the accompanying map. The following figures show the refining and marketing situation that exists in the states comprising the area under consideration.

If we add to the foregoing table the other Atlantic Coast states of Virginia, North Carolina, South Carolina, Georgia and Florida, the total gasoline production is only increased to 38,980,000 barrels, while total consumption is increased to 65,288,000 barrels; an indicated shortage of 26,308,000 barrels.

VENEZUELA A FACTOR

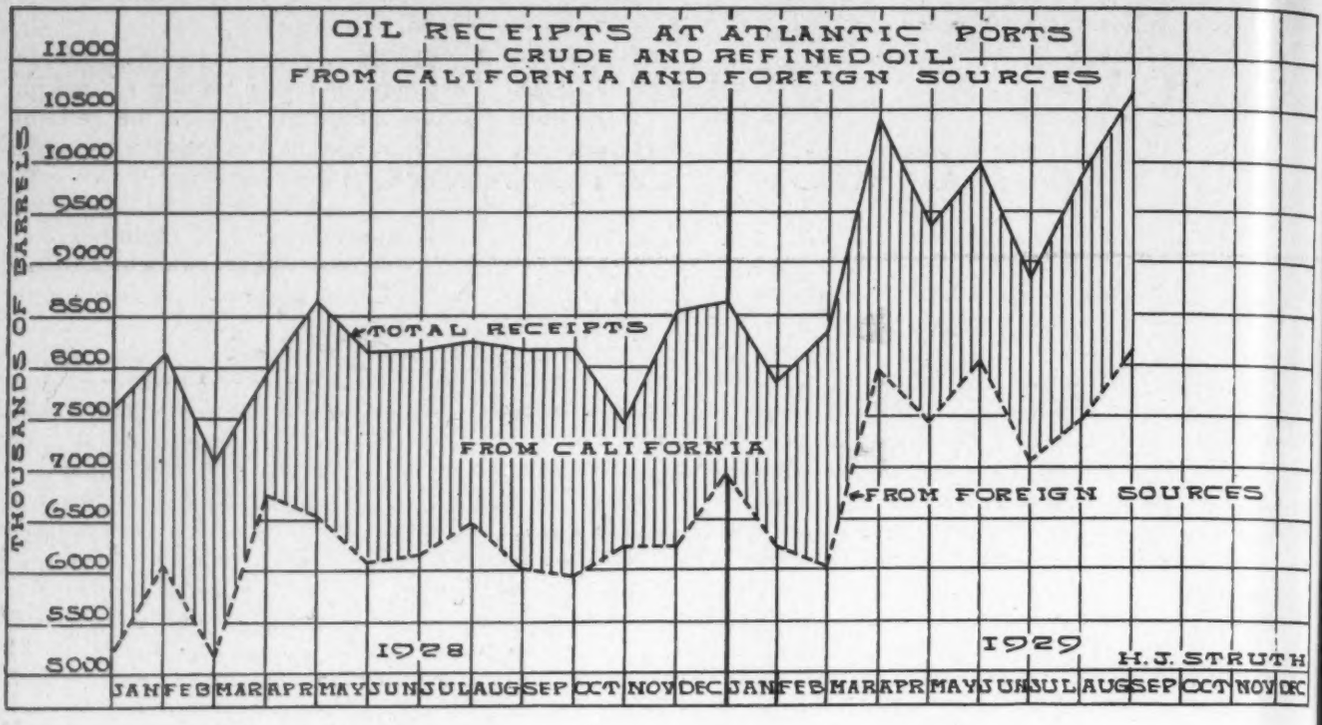
In view of developments in Venezuela, South America, which point definitely to consistent future increased crude production, and consequently a growing influx of crude on the Atlantic seaboard of the United States, it is logical to assume that increased refining capacity will be necessary in this area in the future. Notwithstanding the proposal from some in the industry to place an import duty upon foreign crude, there is every indication that our imports of South American oil will assume much greater proportions. Since American capital is invested in the prolific oil producing areas of Latin America, it must be conceded that any action taken on this proposal would fall far short of realization upon sound economic considerations alone. The petroleum industry of the United States cannot afford to exclude foreign crude, particularly that produced by American oil companies. The importation of foreign crude is really an advantage to the United States. Overproduction has, however, given undue cause for alarm, resulting in the advocacy of a crude tariff as an alleged protective measure to the industry.

ENCOURAGE IMPORTATION

Sooner or later it will be realized that it is up to the American petroleum industry to encourage increased importation of foreign crude supplies, not only because of the probability of a deficient domes-

Table 1—Refining and Marketing on the East Coast

	Gasoline Production (Marketed) (Thousands of barrels)	Gasoline Demand
New York	2,483	12,464
Connecticut	...	2,868
New Jersey	20,946	5,343
Rhode Island	806	1,050
Massachusetts	5,038	5,641
Vermont	...	533
New Hampshire	...	909
Maine	...	1,222
Pennsylvania	5,924	11,125
Delaware	...	486
Maryland	2,879	3,071
Total	38,076	44,712
Exports (Net)	...	5,587
Grand Total	38,076	50,299



tic supply, but mainly because it is sound economic practice to conserve our own resources as long as it is possible to obtain a growing proportion of our requirements from any other parts of the world. If less attention was paid to the premature development of proven oil areas in the United States and more attention was given to obtaining foreign concessions and carrying on an extensive development plan in other countries, the United States would be assured of an adequate supply of oil for a long time. As it is, premature development in the United States will undoubtedly make it necessary in the near future for the industry to depend more and more upon foreign crude to supply its growing requirements. Under these conditions it is futile to even think of placing an embargo upon foreign crude.

11 MILLION BARRELS WAITING EXPORT

Our imports of crude from South America are grownig rapidly, with the prospect of being further accelerated in the near future. Efforts now being made at Maracaibo, Venezuela, to facilitate the movement of tankers over the sand bars at the outlet of Lake Maracaibo may soon create a much heavier movement of crude to the United States. The fact that on June 30, 1929, there was a total stored supply of Venezuelan crude, in American tanks, awaiting shipment, of 11,215,000 barrels, indicates the possibilities that will accompany more rapid movement of shallow draft tankers from this region. Naturally, any marked gain in shipments of Venezuelan crude to the United States must necessarily contemplate its disposal. Since the Atlantic seaboard is the focal point of South American imports, it follows that the industry must take advantage of the situation and facilitate its manufacture into marketable products. It is therefore apparent that the anticipated increase in imports of South American crude will undoubtedly induce expansion of refining facilities in the territory adjacent to the principal port of entry, New York.

The accompanying chart shows what is happening on the Atlantic seaboard through the advent of increased importation of foreign crude, as well as an accelerated movement of surplus crude and gasoline from California, via the Panama Canal. During August, receipts of petroleum and its products at Atlantic Coast ports reached a new high record of 10,691,000 barrels. There has been a steady increase in receipts on the Atlantic seaboard, not only due to increased importation of foreign oil, but also through a marked increase in receipts from California. In addition, this area also receives huge shipments by tanker from the Gulf Coast area, as well as large rail shipments from inland points. This influx of oil in practically one concentrated area presents a problem to the industry that can apparently only be solved by increased facilities for conversion of its major proportion, crude oil, into finished products.

SOUTH AMERICA AND CALIFORNIA EXPORTS

Table 2 shows the influx of petroleum on the Atlantic Coast, originating in South America and California. The growth shown over this period is expected to be greatly exceeded during next year, emphasizing the apparent need for expanded refining facilities on the Atlantic Coast.

While shipment of petroleum and its products from California to the Atlantic Coast have shown a marked increase during recent months, it is noted from the detailed statistics that the movement of crude is waning, while the movement of finished gasoline has shown an appreciable gain.

It is too expensive to ship large quantities of crude from California to the Atlantic Coast. Increased momentum from that score is not probable. However, California refiners have found it highly profit-

Table 2—Influx of Petroleum on Atlantic Coast From California and Foreign Sources
(Thousands of Barrels)

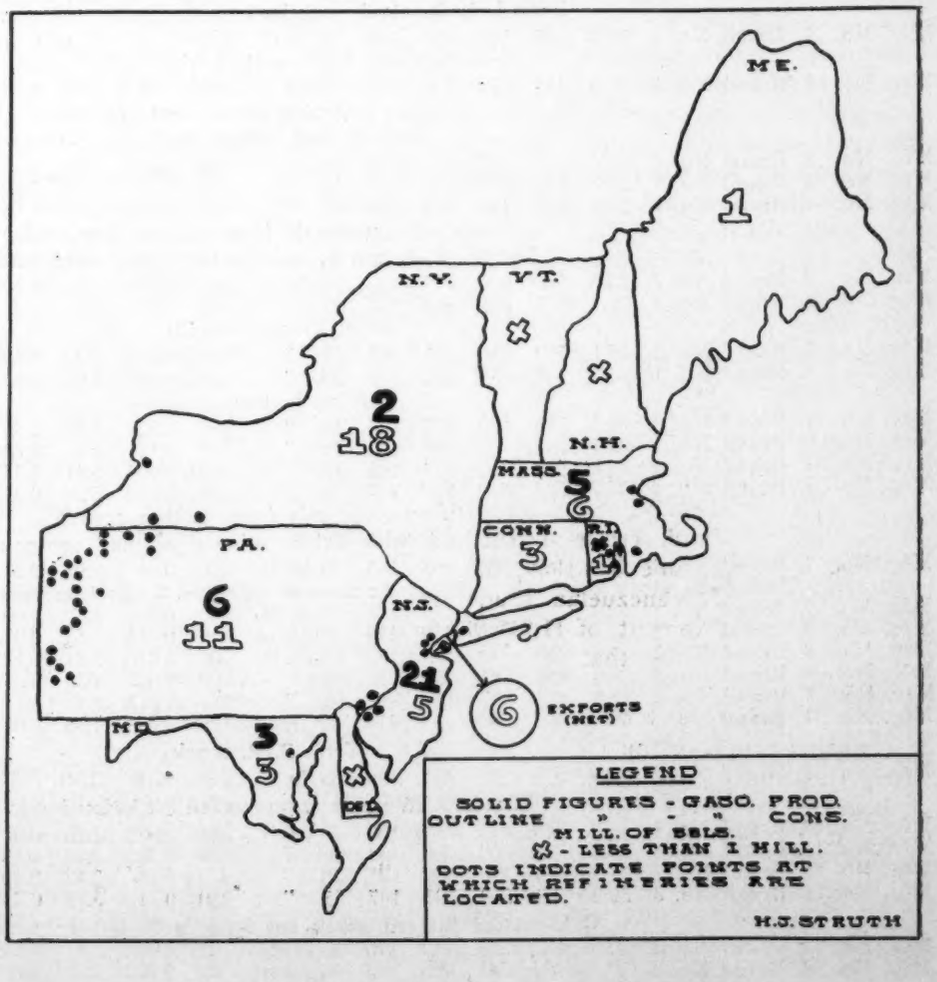
1928	From Foreign Sources	From California	Total
January	6,040	2,065	8,105
February	5,175	1,892	7,067
March	6,763	1,161	7,924
April	6,524	1,991	8,515
May	6,094	2,031	8,125
June	6,150	1,997	8,147
July	6,481	1,739	8,220
August	6,003	2,159	8,162
September	5,926	2,249	8,175
October	6,208	1,250	7,458
November	6,205	2,317	8,522
December	6,922	1,689	8,611
1929			
January	6,246	1,621	7,867
February	6,010	2,291	8,301
March	7,981	2,420	10,401
April	7,445	1,934	9,379
May	8,039	1,950	9,989
June	7,079	1,773	8,852
July	7,497	2,366	9,863
August	8,112	2,579	10,691

able to ship finished gasoline to the East Coast, in competition with other sections of the country. Obviously, the movement of finished gasoline from California to the Atlantic seaboard is decidedly more advantageous than to ship raw crude that distance. In the case of Venezuela, the situation is decidedly different. Lack of refineries there makes it imperative to ship raw crude to the nearest port with proper manufacturing facilities. In fact, the cost of transportating crude from Maracaibo, Venezuela, to New York is considerably lower than the cost of shipping crude by tanker from Port Arthur, Texas, to the same point. Since Venezuelan crude can be produced at a low cost, with the actual delivered price in New York somewhat below that of domestic production, this movement will continue at increased momentum, as long as American capital plays such a prominent part in developments there.

It would be equivocal to state that there will be an immediate change in the geographic status of the refining industry. Our present refining facilities are more than adequate to satisfy immediate requirements. However, a look into the future cannot fail to reveal a decided necessity for increased refining facilities on the Atlantic Coast.

Increased receipts of South American crude on the Atlantic Coast may even bring about a situation in the future where practically all of the refining facilities of that area will be devoted to the conversion of foreign oil into finished petroleum products. Thus, there is a possibility that the East Coast may eventually become the chief oil refining area of the United States, notwithstanding the fact that Texas and California now constitute the leading refining states. Such a possibility offers the conclusion that California may eventually be removed entirely as a factor in the Eastern gasoline market, while crude producers throughout the Mid-Continent area may eventually face the prospect of an utter lack of demand for their crude along the East Coast.

The Atlantic Coast area will always be confronted with the necessity for an outside supply of crude, since the Eastern area cannot attain the status of Western oil producing states. The future of the refining industry along the Atlantic Coast, therefore, lies in close harmony with the future of South America as a producer of crude. As increased supplies of foreign crude are made available to this area, decreased demand for American crude will result proportionately. Eventually, this situation is bound to result not only in the entire elimination of domestic crude from these refineries, but also greatly expanded facilities for the conversion of foreign crude exclusively.



Study in the Manufacture of Ice Machine Steam Cylinder Oil

By H. L. KAUFFMAN

IN no industry is the use of oil of the proper quality and grade of more importance than in the lubrication of steam engines of ice plants, especially in "distilled-water" types of plants where the distilled water is made by condensing the exhaust steam from the steam engine. (This type of plant differs from the "raw-water" ice plant mainly in the means provided for removing oil and impurities from the distilled water.) The use of steam-cylinder lubricants of the proper quality and grade in such distilled-water ice plants is very important in order to avoid the presence of oil in the condensed steam.

To avoid the presence of oil in the distilled water, Vacuum Oil Company makes recommendations as follows[1]:

1. Select a steam cylinder oil possessing the highest possible value as a lubricant.
2. Apply that oil in the very smallest quantities that will meet the requirements of lubrication, using a mechanical force feed lubricator, with atomizer in steam pipe or direct feed to cylinder, depending on engine type.
3. Use a large and effective oil separator or grease extractor and avoid any large accumulation of oil in it.
4. Keep the reboiler and skimmer in effective operating condition.
5. Use effective filtering material in the filters or deodorizers, changing these materials as often as necessary.

In the use of ice-machine steam cylinder oils, there should be no excessive loss of oil. Consequently, the oil employed must not be too thin, requiring an excessive amount for lubrication; but, instead, should be of exactly the correct body properly to meet conditions and applied in just the correct amount to the rubbing parts. Under certain

[1]From "Refrigeration Plant Lubrication," copyright 1924 by the Vacuum Oil Company.

TABLE 1
RESULTS OF TESTS ON ICE-MACHINE STEAM CYLINDER OILS

Manufacturer and Brand	Grav. API.	Fl. °F.	Fr. °F.	Vis. at 150	Vis. at 210	C. T. Cast °F.		Lov. Col. 10% Soln.	Ash %	Car. Res.	Tar %	Ins. Mat. ter %	Demul-sibil-ity No.	Sapon-ification value	Free fatty oil %	
Untrtd. S.-R. stock, cut back with lighter mineral oil																
Mfg. No. 1, Brand No. 1	20.8	450	515	480	110	30	D. G.	270	0.12	2.56	0.47	.09	1560			
(possibly cut back with asphaltic base oil)																
Mfg. No. 2, Brand No. 1	25.0	485	590	503	140	20	"	400	0.06	2.61	0.55	.27	24			
(gravity indicates eastern base crude)																
Untrtd. S.-R. stock, straight																
Mfg. No. 2, Brand No. 2	25.5	525	625	557	159	50	D. G.	520	0.024	3.17	0.40	.06	36			
Mfg. No. 3, Brand No. 1	25.7	530	610	519	160	35	"	350	0.021	2.69	0.127	.076	133			
Mfg. No. 4, Brand No. 1	24.9	505	585	772	210	40	"	400	0.027	3.35	0.16	.05	30			
(above oils apparently from eastern base crude)																
Untrtd. S.-R. stock, compounded with fixed oils																
Mfg. No. 2, Brand No. 3	22.6	520	600	499	143	50	D. G.	400	0.210	3.54	0.50	.25	1620	8.25	4.35	tallow
Mfg. No. 4, Brand No. 2	25.1	505	605	502	147	35	"	400	0.025	2.80	0.30	.094	84	12.45	6.4	"
(from eastern crude)																
Mfg. No. 1, Brand No. 2	25.1	540	650	565	165	50	"	600	0.012	3.40	0.48	.085	41	14.67	7.1	"
Mfg. No. 5, Brand No. 1	24.6	540	655	524	166	30	"	345	0.051	2.91	0.19	.038	1620	9.26	4.7	"
(from eastern crude)																
Mfg. No. 1, Brand No. 3	24.5	525	630	675	174	45	"	230	0.028	2.88	0.36	.04	38	10.17	5.1	"
Mfg. No. 6, Brand No. 1	23.4	555		665	184	85	"	500	0.13	4.15	0.72	.23	24	3.28	1.7	"
Mfg. No. 2, Brand No. 4	24.8	595		622	185	35	"	600	0.065	3.41	0.55	.15	113	11.45	5.8	"
Mfg. No. 3, Brand No. 2	25.7	565	640	750	217	30	"	390	0.012	3.22	0.31	.165	60	7.33	3.7	"
(above four oils from eastern crude)																
Untrd. S.-R. stock cut back with lighter mineral oil and compounded with fixed oil																
Mfg. No. 1, Brand No. 4	23.9	460	585	583	165	20	D. G.	400	0.01	2.83	0.31	.18	30	7.0	3.6	tallow
Trtd. S.-R. stock cut back with lighter mineral oil (last 3 oils also compounded with fixed oil).																
Mfg. No. 7, Brand No. 1	22.1	455	545	450	125	50	D. G.	250	0.045	2.7	0.09	.098	396			
Mfg. No. 8, Brand No. 1	22.5	475	570	459	129	45	green	110	0.018	2.3	0.011	.037	178			
Mfg. No. 8, Brand No. 2	21.4	465	550	555	142	85	D. G.	300	0.010	3.8	0.12	.154	150			
Mfg. No. 4, Brand No. 3	22.4	460	545	435	126	90	"	400	0.067	4.36	0.23	.10	300	9.35	4.77	tallow
Mfg. No. 7, Brand No. 2	18.0	475	560	489	131	85	"	150	0.017	2.8	0.25	.13	110	4.4	2.9	degras
Mfg. No. 1, Brand No. 5	26.4	495	590	354	113	50	green	125	0.021	1.66	0.06	.03	341	10.0	5.1	tallow
Trtd. S.-R. stock																
Mfg. No. 9, Brand No. 1	22.9	510	585	651	160	65	D. G.	270	0.18	2.50	0.35	.48	200			
Trtd. S.-R. stock compounded with fixed oils																
Mfg. No. 10, Brand No. 1		520	615	444	139	20	D. G.	345	0.029	2.56	0.07	.068	1320	10.5	5.3	tallow
Mfg. No. 11, Brand No. 1	21.2	515	600	466	133	15	"	310	0.16	3.72	0.10	.224	125	23.1	12.2	fish oil
Mfg. No. 11, Brand No. 2	21.3	500	590	508	137	30	"	275	0.25	3.42	0.20	.270	156	13.3	7.0	" "
Mfg. No. 11, Brand No. 3	20.9	500	590	493	147	55	"	250	0.21	3.68	0.25	.407	93	11.6	10.0	degras
Cold-settled filtered stock cut back with lighter mineral oil																
Mfg. No. 12, Brand No. 1	22.1	465	525	412	116	35	green	25	0.002	1.97	0.006	.010	1620			
Mfg. No. 8, Brand No. 3	22.5	460	545	436	123	40	green	52	0.002	2.2	0.004	.007	1600			

conditions, too, the use of a straight mineral oil that will not readily emulsify is necessary.

In the present article will be presented the results of a study made to determine the characteristics of oils most generally accepted by the trade for the lubrication of steam cylinders in ice plants—especially in so far as those characteristics indicate the crude from which the oil was obtained and just how the particular lubricant was made.

Table 1 shows the results of tests on 27 different samples of ice-machine steam-cylinder oils from 12 different manufacturers, grouped according to the characteristics of the product marketed.

Of the 27 samples tested, two gave very definite evidence of being cold-settled filtered stocks (Brand No. 1 of Mfg. No. 12 and Brand No. 3 of Mfg. No. 8). Both oils appeared to have been made by cutting back a bright stock with a lighter mineral oil to a viscosity of 116 and 123 seconds, respectively.

Almost half of the samples examined gave evidence of having been made from Pennsylvania or similar paraffin-base crude, namely:

	Number of Samples
Untreated steam-refined stock, straight	3
Untreated steam-refined stock, cut back	1
Untreated steam-refined stock, compounded with fixed oil	8
Untreated steam-refined stock, cut back and compounded	1
Total	13

All of the above oils possessed a relatively high gravity and a low carbon residue, characteristics that are typical of Pennsylvania and similar high-grade, paraffin-base crudes. Viscosity at 210°F. on the above samples ranged from 140 to 217 seconds, average 170 seconds.

Tests on the remaining samples indicated that

(*Continued on page* 84)

Rapid Method of Testing High Sulphur Gases in the Field

By M. J. LEAHY, M. S., (M. E.)

MANY of the newer oil fields, especially those in West Texas, produce oil and gas that contain varying amounts of sulphur. The sulphur in the gas from these wells is in the form of hydrogen sulphide which is a poisonus and corrosive gas. When the hydrogen sulphide content is greater than 0.5 per cent by volume, the gas becomes unfit for domestic use. It also becomes increasingly expensive to extract the gasoline from the gas as the gas itself must be treated for the removal of the hydrogen sulphide prior to the extraction of the gasoline or the gasoline itself will be very "sour." Consequently, millions of cubic feet of gas containing from one per cent to as high as 12 per cent of hydrogen sulphide are going to waste daily in these fields.

Nearly every oil company that has production in any of these fields has had the gas from its wells tested in an effort to determine the amount of gas being wasted and the percentage of hydrogen sulphide in the gas from each well. Since there is no standard method of testing natural gas for hydrogen sulphide, each chemist uses his own method and consequently the results obtained by different chemists have no common basis for comparison. Some testers obtain samples of the gas in the field in glass containers and have these containers shipped to the laboratory where the gas is analyzed by methods of titration with standard chemical solutions. Others bring the standardized solutions to the field and there make their analyses. Both methods are inaccurate and expensive as there is great danger of the gas leaking out of the containers or reacting on the stoppers during shipment in the one case and in the other case standardized solutions cannot be kept long in the fields without losing their normality. This is due to the fact that there is always present a certain amount of hydrogen sulphide in the atmosphere surrounding these fields. This will react with the standard solutions and ruin them.

Some time ago the author was faced with the problem of testing a large number of wells located in each of three of the principal oil fields in West Texas for gas volume, gasoline content, and hydrogen sulphide content. It was specified that the testing be done rapidly so that a full report could be available as soon as possible. Feeling that any method that required titration would be too slow, if not inaccurate, a simple method was devised that is rapid and accurate. This method has been thoroughly tested and checked in the field and in the laboratory. It was also used extensively to check the results obtained in a semi-commercial gas treating plant erected and operated by the author in West Texas. In all cases, the method proved itself to be very accurate, rapid and economical.

The materials required for the complete testing of these gases include: A portable flue-gas analyzer similar to the Orsat-Muencke Apparatus, specific gravity bottle, stop-watch, dry test gas meter, set of gas washers which should preferably be made of two-inch pipe and connected in series by means of one-fourth inch pipe, pitot tube and manometer, rubber tubing which should be one-fourth inch heavy walled tubing, a number of charcoal tubes filled with activated charcoal, a quantity of potassium hydroxide sticks, iodine crystals, potassium iodide, common table salt, and a canister gas mask similar to the Burrel Gas Mask with the Type 2 cannister.

A strong water solution of iodine in potassium iodide is prepared and the proper amount of this solution is placed in the absorption pipette nearest the measuring burette in the gas analyzer. A strong potassium hydroxide solution is placed in the second

pipette, while the third pipette may be left empty or else filled with a pyrogallol solution to be used if it is suspected that the gas to be tested contains some air. Next a small quantity of common salt solution of about 10 per cent strength is placed in the levelling bottle of the analyzer as it has been found that none of the constituents of the high-sulphur gases is soluble in this solution. The gas washers are partly filled with a strong solution of potassium hydroxide. Potassium hydroxide is used in preference to sodium hydroxide as the absorption of carbon dioxide in sodium hydroxide soon changes this solution to a jelly-like mass that is hard to remove from the washers.

Since practically all the wells in the high-sulphur gas area are equipped with oil and gas separators, the gast tester should assemble his equipment at the separator, note the pressure on the separator, and then close the lower gage cock on the gage column of the separator. The drain cock should then be opened so that the oil in the glass will be blown to the air. A short length of rubber tubing should then be slipped over the drain cock and then the gas should be permitted to blow through this tubing until it is purged of air. The gas analyzer should then be filled from this tubing with the proper amount of gas. This sample should then be passed through the iodine solution until it is certain that all the hydrogen sulphide has been absorbed by the iodine. The same sample of gas should then be passed through the hydroxide solution in the second pipette to absorb the carbon dioxide present. Since these analyzers hold exactly 100 milliliters of gas, direct readings of the percentages of the hydrogen sulphide and the carbon dioxide can be taken.

It may be noted here that practically all the high-sulphur gases contain some carbon dioxide. Before this was known, many chemists used a solution of caustic in which to absorb hydrogen sulphide. Since caustic also absorbs any carbon dioxide present in the gas, their test showed a much higher percentage of hydrogen sulphide than the gas actually contained. Check tests should be run with the analyzer until two or more samples of the gas give the same result.

The gas washers should then be attached to the tubing leading from the drain cock. At the same time, a sample of air should be drawn into the specific gravity bottle and its outflow time determined. Then a sample of the gas that has passed through the gas washers should be drawn into the specific gravity bottle and its outflow time determined. From these data the specific gravity of the gas can be very easily calculated and from this value it is possible to determnie the number of cubic feet of gas to pass through the activated charcoal tube in order to saturate the charcoal with gasoline from the gas. After this value has been determined, the test meter is connected to the outlet from the series of gas washers by means of rubber tubing and the rate of flow of gas through the meter is regulated so that the proper amount of gas is passing through the meter. The charcoal tube should then be attached to the meter outlet. While the sample of charcoal is being saturated, the tester may determine the volume of gas issuing from the well by means of the pitot tube and manometer.

As soon as the charcoal in the sample tube is saturated, the tube should be removed and a slip of paper containing all the data on the gas should be rolled up and pushed into the opening in the side of the tube. This should be done to prevent the loss of some of the charcoal and to guard confusion of the data pertaining to each sample. The tubes may be then sent to the control laboratory for distillation tests for gasoline content.

Since it has been found that the percentage of hydrogen sulphide in the gas depends to a great extent on the pressure maintained on the separator, it is best to have the separator pressure the same at all wells to be tested. This may be impossible in some fields as a change in pressure on the separator changes the rate of flow of the well which will in turn disrupt proration allowances if carried to extremes.

Further, it will be much safer to wear the gas mask when testing the volume of gas from the well on account of the fact that hydrogen sulphide is very poisonous and one has no warning of its deadly action except that it seems to have been established that as long as one can smell the hydrogen sulphide there is but slight danger of being overcome. But the disadvantage to this is that the tester is apt to become absorbed in his work and will not think to pause and sniff the air to determine if he can still smell the hydrogen sulphide.

Finally, since the gas that enters, the test meter is free from both hydrogen sulphide and carbon dioxide, corrections must be made for the loss in volume due to these constituents if the exact amount of gasoline contained in the untreated gas is desired.

Gover Process Built on Use of Diphenyl as Indirect Heating Medium

(*Continued from page* 65)

boiler; is then carried off through an air preheater and part of the waste gases is recirculated and part is run up the stack.

"In the apparatus as shown, the waste heat gases enter the diphenyl boiler at 1800, leave the diphenyl boiler at 1000, enter the waste heat boiler at 1000, leave the waste heat boiler at 600, and the gases going up the stack are at a temperature of 300. The preheated air going into the burner is heated at 350. The steam in the waste heat boiler is under a pressure of 150 pounds.

"Steam, in excess of that required in the operation of the jet ejectors, is discharged into the main plant steam system through reducing valves.

"In the apparatus in use the diphenyl boiler and waste heat boiler take care of three evaporating pans, and the diphenyl boiler furnishes 15 million B.t.u.'s per hour in the form of its vapor. The diphenyl is circulated through the tubes at 11 feet per second, and the water circulates through its heating tubes at a rate of 11 feet per second. Under constant use, there has been no stoppage whatever of the diphenyl, nor any decomposition, and in the waste heat boiler, there has been no stoppage of the tubes, even where extremely muddy water has been used."

Resin Substances in Lubricating Oil and Their Effect Upon Steel

THE term "resin" or "resin substance" may refer to resins proper — that is, asphaltenes — formed in petroleum by the ordinary process of oxidation, or it may mean resinifying substances consisting chiefly of unsaturated hydrocarbon compounds which undergo polymerization as the result of the action of caustic soda, concentrated sulfuric acid, etc.

There are two groups of methods for determining resin substances; the first is based upon the separation of resins already present; the second, upon the capacity for resinifying.

In the first group are to be mentioned the following methods:

1. Holde's method of separating the residue insoluble in benzine and extracting it with benzine.
2. Gurwitsch's method of extracting the resin with fuller's earth.
3. Holde and Eickmann's method of treatment with animal charcoal.

In the second group are:

1. Kissling's method of treatment with strong alcoholic solution of caustic.
2. Determination of the iodine number.
3. Determination of the formolite number worked out by Marcusson, and also by Nastjukov.
4. The soda test, much used in the United States.
5. The different forms of treatment with sulfuric acid.

Conradson's method of determining the coke in an oil by heating a sample in a closed crucible tests the fitness of the oil for use where conditions of high temperature and limited access of air prevail.

The sulfuric-acid method is the most generally applied and the simplest, but it is only a rough approximation. Part of the unsaturated hydrocarbons are converted to ethereal sulfates; the aromatics give sulfonic acids; the pyridines, the corresponding salts. The sulfuric acid also has an oxidizing action. Part of the products of reaction dissolve in the acid, part float on the surface as a viscous black mass. With high resinification the whole liquid may turn black, with no possibility of distinguishing between acid layer and material being investigated.

The method of Armani and Rodano is as follows: 10 grams of the oil are dissolved in 100 c. c. of petroleum ether, sp. gr. 0.700, and shaken with 5 c. c. of concentrated sulfuric acid. After standing, 50 c. c. of the oil solution is taken and evaporated to constant weight. This weight is multiplied by 2. (This disregards the 10 c. c. of the sample). Any loss in weight is assumed to be due to the removal of resins. From the results of 30 trials of this method Borodulin found (Petroleum Zeitschr., December 1, 1927) that it was applicable only to lubricants containing 40 per cent. or more of resins, where a difference of several per cent. is not important. The method gives low results: first, because the petroleum either evaporates, leaving the solution denser than at first; secondly, because the sulfuric acid forms with unsaturates compounds that can not be washed out and these ethereal compounds raise the gravity. The specific gravity of a transformer oil, according to Borodulin, rose from 0.888 to 0.893; that of a petroleum, from 0.824 to 0.830.

Apart from the defects of the sulfuric-acid method referred to above, under the same conditions of experiment and for the same oil, it gives consistent results; and it represents the most rigorous test of the tendency to form resins. Tests by this method were usually carried out, according to Veith, using 20 per cent. of sulfuric acid, 40 per cent. of the oil, and 40 per cent. of benzine. This was shaken for one minute and then allowed to stand until the boundary between the two layers was constant. With products high in resinifying substances, 20 per cent. of acid was used (95-96 per cent.), 20 per cent. of oil, and 60 per cent. of benzine. This method is generally applicable in practice; the next best is probably the method of Armani and Rodano.

Borodulin states that the question as to the chemical action of the resin and oxidation substances in petroleum oil upon steel has not been fully answered. The idea has got abroad that easily oxidizable constituents give off oxygen and in turn may contribute to the formation of rust, but there is no generally accepted opinion. In order to answer the question, the action of lubricating oils upon polished steel plates was tested. The steel contained: carbon, 0.36 per cent., manganese, 0.69 per cent., silicon, 0.25 per cent., sulfur, 0.033 per cent., and phosphorous, 0.12 per cent. The plates were covered with the experimental materials and kept in a moist atmosphere under a bell jar from two to four weeks. In many cases the test was made more stringent by the pressure of nitric-acid vapors. The oxidation of the steel showed no correspondence with the content of resinifiable substances. The viscosity of the oil was the most important factor, determining as it did the degree of protection against the external oxidizing agencies, oxygen, carbon dioxide, and water. The resin substances increase the viscosity and especially the power of adhesion, a factor to which too little consideration has been given. According to Dunstan and Thole, the adhesive force is greater in unsaturated hydrocarbons than in saturated; in other words, the lubricant with the highest content of resinifiable substances adheres most firmly to the metal.

Under normal conditions the resinifiable substances

do not oxidize easily. For instance, the quantity of asphaltenes insoluble in benzine in a cylinder oil was found by Borodulin not to have increased at all in an hour's heating at 250°C. But if the unsaturated compounds were destroyed and removed, the oil became less resistant to oxidation. Tytschinin and Butkov found that a transformer oil purified with 10 per cent. of sulfuric acid in the usual way withstood an oxidation test satisfactorily. But if 20 per cent. of acid was used, the oxidation produced 40 per cent. of resins. Work reported by other investigators also supports the view that certain quantities of resin-forming substances are useful in oils.

Modern Steam Still Fitted With Steam Heater and Its Probable Location

By GEO. F. BURDICK
Of C. Braun & Company

At California National Gas Association meeting, September 12, 1929

ASIDE from the absorber, the heart of the modern gasoline plant is the still. The other apparatus, such as exchangers, preheaters, coolers, condensers, etc., merely serve as heat conveyers or transfer vessels. Their duty is to exchange heat with the smallest expenditure of energy; that is, pressure drop which represents pumping head.

The function of the still is to strip the absorption oil of gasoline, using the smallest possible amount of agitation steam. To attack this problem we must recognize two fixed conditions: 1. That a definite pressure is desired and is necessary in order to condense the gasoline produced. 2. That it costs very little more to carry a high oil temperature than to carry a low temperature in the still.

Most of the heat will form a recycle through the interchangers. The effluent oil temperatures from the exchanges will remain practically constant. The only limit in temperature is reached when the heating medium-saturated steam reaches such high pressures that boiler installations, steam lines, and their maintenance costs become prohibitive.

This paper will not be of a technical nature, but merely an outline of conclusions we have reached based upon various data obtained from tests on actual field installations.

Figure 1 shows an outline of the bottom or stripping section of the last still tested. The still is 60 inches in diameter by approximately 42 feet in height. It contains 16 trays, eight in the stripping section as shown, and eight in the fractionating section above the feed nozzle. The trays are of standard bubble cap design and are spaced on 18-inch centers. This apparatus was designed for circulation of 320,000 gallons of absorption oil and a gasoline production of 30,000 gallons per 24 hours. The reheater shown in Figure 1 has approximately 250 square feet of heating surface. The preheater is of similar design and size. The stripping steam was introduced below the bottom tray and above the oil level.

The temperature gradients shown by curves A, B, C and D, Figures 2 and 3, indicate that relatively small quantities of vapors are formed in the reheater.

Figure 2 shows temperature gradients through the

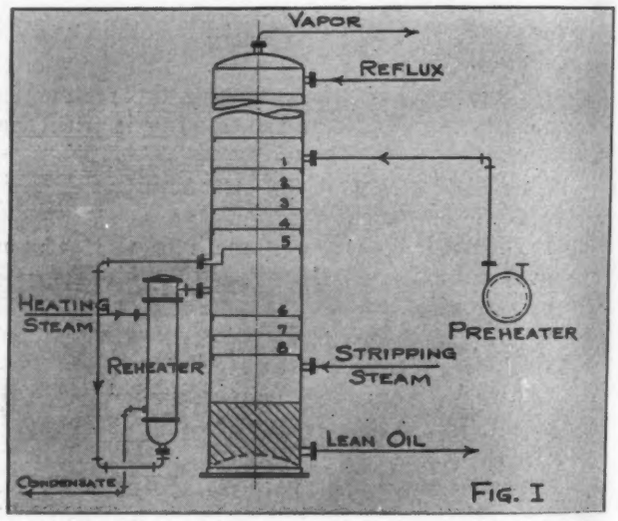


FIGURE 1

stripping trays with and without the use of a preheater. The reheater was used in both cases.

Curve "A" shows the temperature of the oil before entering the still was 266 °F. The reading on tray 1 shows a drop in temperature of 8 °F., which was due to vaporization or flushing of a portion of the gasoline from the fat oil. This vaporization was caused by two things; a decrease in actual pressure from the oil pipe to the still, and the lowering of partial pressure due to the presence of steam in the still. The latent heat of vaporization was drawn from the sensible heat of the liquid and vapors.

From trays 1 to 4 (all readings were taken in vapor spaces above the trays) we find there was a slight drop in temperature—some 3°F. in 4 trays. Tray 5 showed an increase of 8°F., while there was a rise of 62°F. in the reheater. The rise of 8°F. between plates 4 and 5 indicates that considerable vapors were formed in the reheater and traveled through the gas or vapor risers of plate 5. These vapors in turn heated the liquid and vapors on plate 5. We observe, however, that the effect does not carry above plate 4. In other words, no appreciable amount of vapors were formed on plate 5. The dotted line indicates what the temperature would

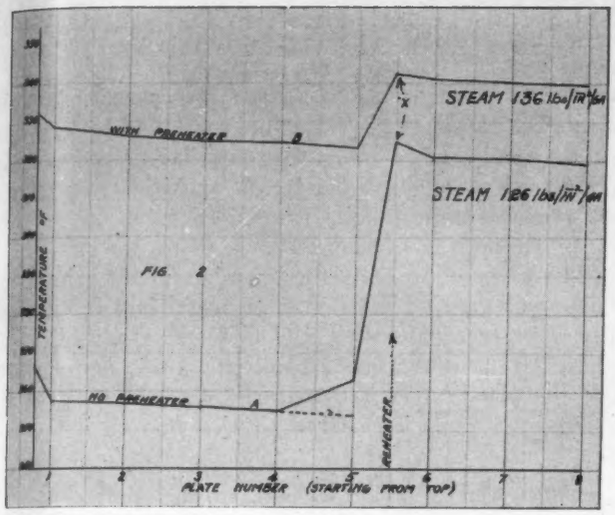


FIGURE 2

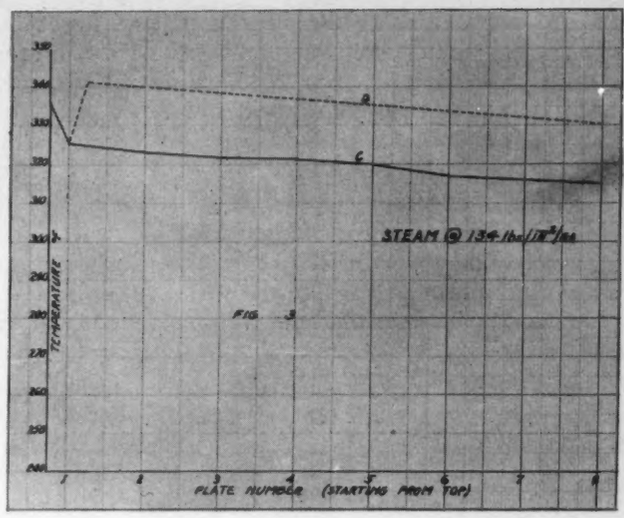


FIGURE 3

have been had no appreciable amount of vapors passed through from below plate 5.

Point "X" indicates a reading taken in the oil returning to the still from the reheater. Tray temperatures 6, 7 and 8 were taken in vapor spaces. This gradient shows a drop of only ½°F. to 1°F., and consequently there was no appreciable liberation of vapor in this section of the still.

The temperature gradient "B" was obtained when both the preheater and reheater, as shown on Figure 1, were used. The oil to the still was 333°F. The drop on tray 1 was only 5°F. This does not mean less total flash, but merely less vapor release due to initial contact with steam in the still. The higher temperature level of 333°F. obtained by the use of the preheater naturally flashed more gasoline vapors than did the temperature of 266°F. obtained in the heat interchangers alone.

The curve shows a drop of 4½°F. to tray 5, which is approximately the same gradient as that portion of curve "A."

The reheater gave an increase of 18°F., but the quantity of vapors formed was too small to register an increase in temperature on plate 5. For this reason I have called the reheater by its true name, rather than the commonly used term "reboiler." Its function in the gasoline plant still is to reheat the oil rather than reboil any appreciable portion of it. Except in case A, where we have an extremely low influent oil temperature we do not have an appreciable reboiling effect.

As indicated on Figure 2, the steam pressure in the preheater and reheater were the same. The oil from the reheater was 10°F. above that from the preheater; which merely indicates less B.T.U. load on the reheater.

Figure 3, curve C, shows a temperature gradient using the preheater alone. Practically the same steam pressure prevailed as in case B. The initial drop in temperature, tray 1, in case C was practically twice that in case B. This, we believe, was due to the fat oil saturation which in C was twice B. Although the fat oil saturations vary widely, we find the temperature gradients below plate 1 are practically parallel.

Curve "D" indicates what will take place when using the same equipment and steam pressure that were used in obtaining the data expressed by curve "B." The marked difference is that the reheater would be between trays 1 and 2.

All other conditions being equal, the steam necessary for stripping is practically inversely proportional to the temperature of the oil; that is, the higher the oil temperature the less steam required. Figure 4 shows the relation between oil temperatures and steam requirements and varying still pressures. This chart may be

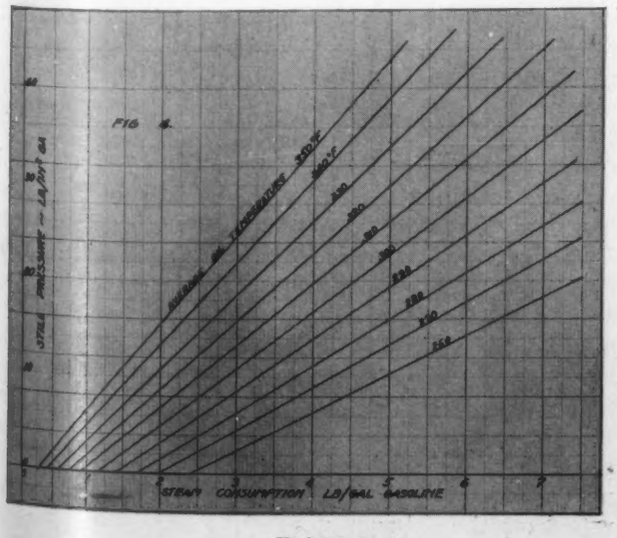


FIGURE 4

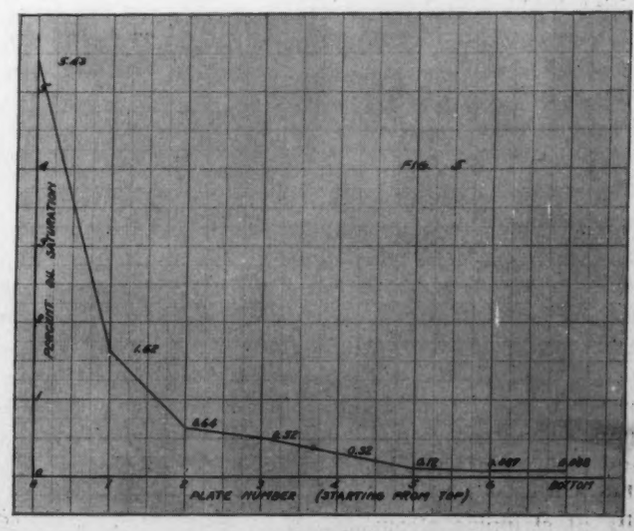


FIGURE 5

used for approximating the amount of steam required for stripping under average conditions. To determine accurately the quantity of steam, we must make corrections to chart 4, taking into consideration:

A. Fat oil saturation
B. Lean oil saturation
C. Quality and temperature of steam
D. Composition of the gasoline
E. Composition of the absorption oil
F. Number of trays in the still.

Let us now analyze the temperature gradients to determine the probable steam saving by shifting the location of the reheater.

The following average temperatures are shown on the gradients

Curve A—281°F. Curve C—320°F.
Curve B—331°F. Curve D—335°F.
D corrected to compare withB—338°F.

This correction is made because curve "D" was built up from C, and curve "C" is some 3°F. below B on tray 1. There is still another correction which might be made, that is, when the reheater is installed, gradient "D" would flatten out below plate 2, because the oil saturation would be less on the lower trays and consequently less latent heat formed in successive flashes. However, we will not use this correction.

With a still pressure of 20 pounds/in.²ga. we find from chart 4, the following steam requirements:

A. 5.75 lb./gal. C. 3.6 lb./gal.
B. 3.14 lb./gal. D. 2.95 lb./gal.
D. Corrected 2.85 lb./gal.

It is obvious that condition A with no preheater is the least economical of the lot.

Condition C, with no reheater, is far ahead of A. The steam consumption is only 63 per cent. of that required in A.

Curve B with the preheater in use and the reheater under plate 5, shows that we need only 87 per cent. as much steam as was required by C.

Condition D corrected, with the preheater in use and the reheater installed below plate 1, we may expect a steam saving of 9 per cent over condition B. This should give us a true comparison of the two locations of the reheater.

Figure 5 throws additional light on the subject of initial flashing and the stripping gradient on the trays. This curve was made from tests on another still with no reboiler in use. It shows more than anything else that most of the gasoline is liberated on plate 1, and that the decrease is almost nil below plate 5. In other words, the greater heat load is on plate 1 with increasingly smaller amounts on the lower plates.

We believe the logical place to install the reheater is between plates 1 and 2; for at this point after two successive flashes, the greater portion of gasoline has been driven off and there will be only small drops in temperature below plate 2. The oil saturation will be low beyond plate 2 with a correspondingly small temperature loss from this point to the bottom of the column. The temperature gradient will remain almost flat and the temperature level throughout the stripping section will remain high, thus demanding a minimum quantity of stripping steam.

STUDY IN THE MANUFACTURE OF ICE MACHINE STEAM CYLINDER OIL

(*Continued from page 79*)

each was made with a treated steam-refined stock, either straight, cut-back or compounded. Only two of these oils gave indications of having been made from a Pennsylvania crude. Viscosities (at 210°F.) on these remaining oils ranged from 90 to 147 seconds, average 130 seconds.

The tarry content of the brands tested varied from 0.004 per cent to 0.7 per cent, very few testing below 0.1 per cent. Since the oils tested are all being accepted by the trade, apparently the per cent of tar contained in an ice-machine steam-cylinder oil in itself is not an indication of the results in service that the oil will give.

The readiness with which the oil would separate from water (demulsibility number) varied considerably on the different brands tested and, in some cases, even on different samples of the same brand. The demulsibility number, therefore, can not be used as an absolute criterion of an acceptable oil for ice-plant use, although—as is self-evident—an oil of satisfactory demulsifying qualities is desirable.

The emulsifying properties of ice-machines steam-cylinder oils here demands some comment. Ordinarily, in contact with water, treated cylinder stocks formed milky, stiff emulsions due, no doubt, to the soaps formed upon neutralizing the oil in the treating process. Treated stocks, not neutralized, but reduced in the acid stage, give unstable emulsions. Untreated stocks also give unstable emulsions. With filtered stocks, on the other hand, very little emulsion is formed when the oil comes into contact with water—in consequence of which such oils are especially desirable for lubricating gas engines, steam turbines and similar equipment. Within a low-pressure, steam engine cylinder, however, the lubricant must emulsify sufficiently to form an adhering film on the cylinder wall. In ice manufacture, when an oil is used in excess, the character of the emulsion exhausted with the steam and the rate of oil separation are therefore very important factors that must be taken into consideration in deciding on the kind of lubricant, the use of which will be most suitable.

In general, the oil to use for ice-machine steam-cylinder lubrication depends on the kind of steam—its temperature, pressure and saturation—as well as on the type of engine. As indicated from the results of the study here presented, no one type of oil can be used to meet all conditions, and many companies market several brands to meet the individual condition. On this matter of the kind of oil that should be used for ice-machine steam-cylinder lubrication, the Vacuum Oil Company has the following to say: "Our experience shows that the correct compounded oil, due to its high efficiency as a lubricant, can be fed in such small quantity that any oil in the condensed steam can be completely removed before it reaches the cans. When the method of steam-cylinder lubrication does not permit the use of a very small oil feed, or when close regulation of feed is not feasible, it is necessary to use a pure mineral oil, which will more readily separate from the exhaust steam."

Before National Safety Council, Chicago, October 3, 1929

Safety in Gasoline and Air-Gas Lift Plants

By H. B. BERNARD
Vice-President Sinclair Oil & Gas Company

ALTHOUGH the beginning of the Industrial era can properly be placed as contemporary to the steam engines of Newcomen, Smeaton and Watt, it is only within the past decade that the cumulative effect of the introduction of mechanical equipment has been climaxed in the new relationships that have grown up between employer and employee. The wide distribution of industrial securities has both brought employer and employee closer together and paradoxically has placed them further apart. Under present economic conditions the employee is also the employer insofar as he owns securities in the company for which he works. On the other hand there has been introduced between employer and employee the management class and it is largely through this intervention that the new relationship in industry has come about.

The machine age has enhanced the importance of manpower, rather than to the contrary, due to both the greater productive capacity and the greater consuming power of the individual. During the past decade as never before there has been brought about a greater appreciation of the value of human life and it has become one of the dominant aims of industry to protect it and conserve it.

This protection to man-kind has been furnished through a campaign of safety, and on the effectiveness of this work the failure or success of an enterprise may largely depend.

One of the leaders in the industrial world in the drive for safety is the petroleum industry. Inherently hazardous, it demands close and specific attention to detail of conditions under which work is carried on, in order that life and property may be safe-guarded and preserved.

Probably that branch of the industry which is engaged in the most consistently hazardous work is in connection with the construction and operation of gasoline and air-gas lift plants. To a great extent the labor employed has been intensively trained and is highly skilled. In order that operations may be conducted economically and efficiently it is incumbent upon the management that every possible measure be taken to properly maintain its staff at maximum effectiveness.

LOCATION FIRST

The first step after conception of an installation of a plant is its location. The plant should preferably be located on high ground because gas pockets are apt to form in lower areas. Before construction starts the plant site should be adequately fenced to minimize exposure hazards and should have proper means of ingress and egress in order that only those concerned in the actual work be permitted the premises.

All tools and equipment used in construction of the plant itself and of the pipe lines serving the plant should be of the best quality and be properly maintained. Proper sanitary facilities, including a supply of pure water, and adequate medical attention are necessities. Frequent inspection by those in authority is of prime importance. My organization goes to the extent not only of examining applicants for employment for physical defects and communicable disease, but insists that all employees take a bath and have their clothes fumigated to insure that they do not carry vermin.

In the general layout of the plant, facilities used for the storage of combustible liquids such as gasoline and oil, should be placed at lower elevations than that of the main plant buildings. In some cases storage tanks should be diked. Cooling towers should be so located that their danger as a hazard in the event of collapse due to tornado will be minimized; their placement should be such that water spray will not contact with electrical equipment which might cause short-circuiting. Boiler houses should be in such relation to other operating facilities that the normal tendency of escaping gas will not be in their direction. Needless to say in the location of any and all equipment, proper provisions should be made for accessibility in order that workers can handle it conveniently and expeditiously and not be subjected to unnecessary exposure to hazard. All buildings should be properly ventilated—this is of prime importance; gas is insidious and asphyxiation might occur without warning.

SAFETY DECIDING FACTOR

The choice of equipment and material to be used in gasoline and air-gas lift plants depends largely on the exercise of common sense. Taking two pieces of equipment of equal performance, of which one is obviously not as safe to operate as the other, permits easy arrival at a decision as to choice. All tankage must be designed with a liberal factor of safety. If the A. S. M. E. Code for Unfired Pressure Vessels is adhered to, no mistake will be made; similarly in the case of boilers. In the latter connection, the choice of water and water treating equipment is very important. A further safeguard lies in providing for boiler insurance in order to obtain inspection on an unbiased basis. In the design and installation of machinery, all moving parts must be adequately guarded and provisions for lubrication and mainten-

ance should be made so as not to expose operators to hazards.

Electrical equipment should be of the most advanced safety type and preferably installed in places or buildings where the chances of having a gaseous atmosphere are slight. All electrical wiring and specialties should be installed under the National Fire Underwriters Code. Substantially designed buildings that will not vibrate are necessary, as vibration sets up stresses and strains in pipe lines carrying gas or gasoline that might result in rupture, and consequently invite accident. It is needless to say that special equipment such as heat exchangers, coolers, condensers, etc., and pipe, valves and fittings should be properly designed and installed with adequate factors of safety to withstand the maximum pressures and temperatures to be encountered. Too often are standard weight fittings installed where high pressure fittings are required, obviously resulting in unnecessary accidents; and, vice versa, frequently high pressure fittings are used where pressures will never exceed 50 pounds or 100 pounds, resulting in unnecessary waste.

As handling heavy machinery is a necessary part of plant operation and maintenance, the installation of a crane is preferable to the use of temporary equipment rigged up for a particular job, as the latter involves unknown factors with a consequent increase of exposure to accident. To meet the contingency of fire or explosion, properly placed fire fighting equipment should be an integral part of any plant, and all plant employees should be trained to be familiar with its use. In laying out piping adequate and properly placed drips, check valves and safety valves should be installed. This is particularly true in the case of starting air compressors where air saturated with oil vapor forms an explosive mixture. Similarly, scrubber tanks, accumulator tanks and headers should be equipped to prevent carrying over of liquids into compressor cylinders.

Of prime importance, particularly in the operation of air-gas lift plants, is that the plant not be switched over from air to gas or vice versa under pressure, as a tremendous exposure to accident is involved. All plant and field lines should be thoroughly purged when such a switch-over is necessary.

It should be an imperative duty to properly maintain all equipment, irrespective of its nature, that is used in connection with plant and field operations. Unfortunately many accidents result from the attitude "We'll fix it tomorrow", or "Its working good enough to get by on."

NINETEEN SAFETY RULES

A discipline comparable to that in army regulations is concomitant with the maintenance of a high morale and esprit de corps.

Outstanding in the promotion of safety is proper educational work. Each accident should serve as the basis of a sermon for the prevention of similar accidents. Descriptive signs and bulletins should be located in and about all plants, and the bulletins should be changed at intervals to maintain employees' interest. Monthly meetings are highly desirable both for general instruction purposes and to have employees discuss among themselves the cause and prevention of accidents, specifically and in general.

Nearly 12 years ago Sinclair Oil and Gas Company prepared its first "Safety Rules," which with modifications and revisions from time to time has admirably served the cause of Safety. The present "Safety Rules" follow—

1. Plant operators will not leave the plant at any time during their tour. Employees will not wear coats with loose sleeves or skirts. Shirts and jumpers should be tucked into trousers. Company unionalls are available for regular employees.

2. Any defects in buildings, machinery, stairs, ladders, walk-ways, equipment, etc., must be immediately reported to the superintendent or chief engineer.

3. When serious or dangerous defects occur in a machine it must be shut down until repaired.

4. Never start an engine of over 35 HP by tramping the flywheels. Before turning an engine over render the ignition system inoperative. Toe boards, floor plaates, guards and railings should be in place before starting any machine.

5. Never stop an engine by pulling off or disconnecting the ignition wires; shut off the gas.

6. If necessary to shut down the entire plant, in case of emergency, pull out levers of fuel pressure regulators on engine fuel gas line. All primary valves must be tagged and all employees must be familiar with their service and location so that in the event of fire the proper valves may be shut to keep the inflammable product from fire.

7. All employees must be familiar with the location of fire fighting equipment and the methods of using and charging same. There must be affixed to all extinguishers a tag showing by whom and when it was last charged. Fire plugs are painted yellow so as to be easily identified. The fire signal is repeated short blasts of the whistle.

8. Smoking or carrying "Strike anywhere" matches inside of the plant fence or buildings or around loading racks is prohibited.

9. Magnetos, spark plugs and other ignition devices must not be tested, repaired or assembled in any building or place where gas or gasoline vapors might be present.

10. All electric lights in any building or place where gas or gasoline vapor might be present must have vapor-proof globes and must not be lighted unless same are in place. Extension lamps are to be kept in order at all times and should not be used unless they have approved cords and vapor-proof globes protected by metal guards.

11. Electric light bulbs must not be removed from or placed in any circuit either inside or outside while the current is on. Electric flash lights must not be switched on or off where gas or gasoline vapor might be present.

12. Waste rags must be kept in cans provided for the purpose except when actually in use. Waste or rags must not be laced around the machinery to

(*Continued on page* 162)

Before the National Safety Council, Chicago, October 1, 1929

Accurate Accident Costs Compilation Assessment and Presentation

By CHARLES M. MILLS
Assistant to the President, Standard Oil Company of Ohio

WE live in an age of mergers and combinations of large industrial enterprises. Holding companies are being formed throughout the land to control operating subsidiary companies. As never before, the burden of proof lies on financial reports of these subordinate corporations and, in turn, upon efficient, well-informed business executives. Management, more and more, is relying on factual data and business research to determine manufacturing methods and sales distribution. Haphazard and guesswork have been replaced by the slidestick of accurate analysis.

The margin of profit in these stirring days lies not so much in increased volume of business but in the savings represented by elimination of waste and reduction of costs. We all recognize that cost adds to the burden of production, reduces profits, decreases dividends, but not all of us appreciate that accident costs are part and parcel of production costs. Do you know what are your real accident costs? What do your accident costs include? Do your accident costs cover "indirect" or "incidental" expenses underlying accidents? Do you assess or prorate your accident costs by departments and divisions? Do you present accident cost statistics to your operating executives? Do you sell your safety program through an analysis of accident costs? These are indeed pertinent questions to discuss.

A few years ago, a small group representing eastern companies met to discuss ways and means of compiling comparative accident data. Out of this rather meager beginning came the creation of the Petroleum Section, National Safety Council. Three years ago the American Petroleum Institute expressed its definite interest in accident prevention work by an appropriation to the National Safety Council for the support of a Petroleum Safety Engineer and the position of our Petroleum Representative, H. N. Blakeslee, is now financed by the American Petroleum Institute. These two great organizations, The National Safety Council and the American Petroleum Institute, are thus united in the common cause of safety in the petroleum industry.

One of the successful features of this work has been the compilation of comparative accident frequency and severity rates for the various branches of the industry. This year 30 separate companies, with 143,206 employees and representing a large portion of the industry, are forwarding comparative accident data to the headquarters of the National Safety Council in Chicago. eW all agree that the collection of such data, and the stimulation of various companies to contest for bronze plaques, is a great boom to all who are engaged in promoting safety in our great industry. So much for self congratulation on our progress.

CHARLES M. MILLS

Entirely apart from the compliation of frequency and severity rates, the problem of accident costs remains an almost untouched field—the compilation, assessment, and presentation of accurate accident costs. First of all, allow me to state that accident costs mean expense involved, either directly or indirectly in the costs of accidents. Items on the general safety program such as the overhead expenses of a safety director and assistants, time of safety committees, safety equipment, installation and maintenance of the same, etc., are not included in this discussion. These costs are clearly accident prevention

costs, and should not be confused with accident cost per se.

ACCIDENT COSTS, DIRECT AND INDIRECT

Accident costs are both "direct" and "indirect". Direct costs are immediate, tangible costs, including:

a. State or company liability or compensation.
b. Accident benefits.
c. Medical and hospital costs (outside of company staff and hospitals).

These costs are usually regularly recorded by many companies along with frequency and severity records. The procedure is so common that further comment is unnecessary.

Indirect costs are the incidental or hidden costs not usually recorded but which are generally absorbed in overhead and forgotten by both operating executives and safety directors.

The indirect costs include:

a. Company medical and hospital expense (usually charged to a medical expense account).
b. Wages paid injured in excess of workmen's compensation or regular company benefits;
c. Time lost due to first aid, dressing, etc., of minor injuries;
d. Time lost by fellow employees not injured;
e. Time of executives, foremen, etc., used in investigation and examination of accidents;
f. Time lost in machinery and equipment stoppage on account of accidents;
g. Other costs, including injury to machinery and equipment; spoilage, waste, interference with production, replacement of injured employees by replacements or substitute employees.

To illustrate, a refinery stillman severly burned incurred a total liability of $176 in state compensation, $52 in accident benefits, and cost $58 in medical and hospital expense—a total of $286 in "direct" accident costs. The "indirect" costs included $12 in company hospital expense, $114 in wages paid in excess of the direct liability of workmen's compensation, $10 in time lost by fellow employees (estimated), $25 lost by supervisory examination (estimated) and $25 in substitution of a replacement (estimated) making a total of $186 in "indirect" costs. The total real cost of the accident was $472, almost $500, instead of less than $300. Which was the real cost of the accident?

I appreciate that many of the items in "indirect" costs included in the above list are almost impossible to ascertain accurately in any branch of the petroleum industry. Due to the widely spread nature of work in production, pipe line and marketing, the time lost items are probably impossible of calculation except by any but fairly rough estimates. In refineries, however, especially where time clocks are used, more accurate calculations can be made.

At least, this much may be said—without some consideration of these hidden factors of indirect costs, we are not yet revealing by a long ways the total actual cost of accidents in our industry, and we are not getting over to operating executives the real picture. Perhaps through this discussion we may lead the way to practical ways and means and devise methods to find out how much real accident costs are eating into production costs. I suggest that this whole question of "indirect" or incidental costs be analyzed and a report submitted by a committee of the petroleum section, National Safety Council. The report should set forth items that can be recorded practically in the various branches of the industry and should point the way to the compilation of more accurate accident cost data.

ASSESSMENT OF ACCIDENT COST DATA

The allocation or assessment of annual costs on a departmental basis is one of the effective methods of establishing marks or standards which operating officials and others may follow for the reduction of accidents. In my experience in more than a dozen petroleum companies, annual accident costs are usually compiled for the whole company and are so presented to executives in an annual report, but are seldom broken down by departments and sub-departments or divisions, or are related to the total payroll involved.

Table shows a typical layout covering assessment of accidents by departments.

First, total accident costs for the entire company and major departments for a five year period should be compiled, together with a five year average; next a percentage of the total costs is made in ratio to the total dollar payroll of the company (in the various departments to the departmental payrolls) and then a five year average percentage. On the five year basis, the estimated projected cost for the ensuing year may be determined both for the company and the departments. Adjustments in the projected costs may have to be made where there has evidently been a sub-normal or excessive number of fatalities, total disabilities, or other factors which disturb the general trend of the accident cost rates. These adjustments may be admitted as weaknesses in the assessment or budgeting of accident costs, but at least the above method provides a convenient yardstick for the measuring of accident costs, and puts the question of the reduction of costs in an effective and simple way before operating executives.

(*Continued on page* 158)

ASSESSMENT OF ACCIDENTS BY DEPARTMENTS

Year	Total Accident Costs				Cost a/c Payroll				Cost Per Case			
	Company	Prod.	Mfg.	Sales	Company	Prod.	Mfg.	Sales	Company	Prod.	Mfg.	Sales
1924	$75,000	$22,000	$40,000	$13,000	1.25	1.10	1.60	.87	$150	$146	$160	$130
1925	60,000	25,000	27,000	8,000	1.05	1.14	1.35	.53	133	125	180	80
1926	55,000	27,000	20,000	8,000	.89	1.13	.95	.47	137	154	167	70
1927	35,000	12,000	17,000	6,000	.54	.48	.77	.33	83	86	121	40
1928	42,000	18,000	15,000	9,000	.53	.62	.63	.33	93	90	115	75
5 Year Average	$53,400	$20,800	$23,800	$ 8,800	.82	.87	1.06	.48	$120	$120	$153	$ 75

PROCEEDINGS OF THE NATIONAL PETROLEUM ASSOCIATION

Atlantic City Session Covers Wide Range of Subjects

By GEORGE H. REID
Associate Editor

ATLANTIC CITY, N. J.—In his opening address before the first session of the twenty-seventh annual meeting of the National Petroleum Association, which convened here September 18, E. M. Lyons, president of the association, stressed the value of co-operative effort on the part of individual members of the industry. He stated that it is impossible to evaluate the dividends accruing from co-operative exchange of ideas and pointed to the fact that development by a group of investigators can more easily be successful than investigation by individual workers.

In the course of his remarks along these lines he said: "Important and progressive industries do not stand still. They undergo fundamental changes, at times slowly, at other times with rapid strides. For the same reason their problems of one period are not those of another. It is equally clear that a trade association must anticipate or at least keep pace with the industry's progress. It can not refuse to recognize changes as they occur nor stand on issues which the industry has outgrown. I have said that the National Petroleum Association is conservative. That is true. Its activities are guided by the best judgment of the trustees after thoughtful consideration. But it is also truly progressive. Of this there is no better evidence than the broadening of its membership. The report of the trustee in charge of membership and relations shows the changes which have taken place. The one essential test for membership is that the refining company shall have a good standing in the industry."

SIX COMPANIES JOIN

The new list of members of the National Petroleum Association includes in this year's report six new companies, bringing the total company membership to 59. The new members welcomed into the association at the annual meeting are as follows: Ohio Oil Company, Pencrude Refining Company, Solar Refining Company, Standard Oil Company of Kentucky, Standard Oil Company of New Jersey, Standard Oil Company of New York, and the Standard Oil Company of Ohio, which latter company was really admitted to membership a year ago.

The broadening of the membership and the increased activities of the association brought about the necessity for increasing the number of association trustees from 15 to 21. At the monthly trustee meetings seven members will constitute a quorum. A new department was added to the eight already in existence, which will function as the department of Insurance. The name of the department of Welfare and Insurance was formally changed to the department of Fire Prevention and Safety, under which name the Association of Fire and Safety Marshals, headed by R. A. Wotowitch, trustee in charge, and James H. Herbert, president, will continue with its program of fire prevention work and first aid training for all member-company employes.

FUTURE POWER PLANT

The interesting program of the annual meeting was diversified, including a number of topics of importance to those in attendance. Following opening address by President Lyons, the paper by Herbert A. Ross, combustion engineer, was read. He stressed the importance of complete utilization of waste heat energy. In conclusion he presented a picture of the future power plant as follows: "This plant will generate steam at pressures of 400 pounds or greater and at temperatures of from 600 to 900°F. This superheated steam will first be passed through turbines and electrical power will be produced by extracting a small amount of thermal energy. It will then be transmitted at high velocities to the various departments through small mains and there be expanded to the pressures and temperatures required for the different processes. Steam will be exhausted from the pumps, and the like, to accumulators which will store the unused energy until it is required for those processes that will require lower pressures, such as the filtering department. This procedure can be made to afford a balance and conservation of heat energy within definite limits of economical operation. This is not a visionary picture, by any means, for such arrangements are being successfully and economically operated in a number of other industries today."

The subject of fire prevention and safety then occupied the attention of the session, with the discussion of the work of the department of Fire Prevention and Safety, led by R. A. Wotowitch, trustee in charge. Interesting and valuable papers were then presented by James H. Herbert, Standard Oil Company of Ohio, president of the Affiliated Association of Fire Marshals, and by J. J. Forbes, United States Bureau of Mines.

PARAFFIN WAX DISCUSSED

A valuable paper was presented dealing with the "Determination of Oil in Paraffin Wax," which was prepared by Dr. D. P. Weld and Dr. J. B. Rather of the Standard Oil Company of New York, in which the work done for the American Society for Testing Materials, through the agency of its Sub-committee 111, of Committee D-2, on Petroleum Products and Lubricants, was discussed. This paper will prove of interest to refiners, chemists and engineers, since it outlines some-

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thing of the past work done in determining actual oil content of wax, and the tentative method recently adopted by the American Society for Testing Materials. The new test is called "Tentative Method of Test for Expressible Oil Moisture in Paraffin Wax." The new method is recommended only for waxes that have melting points of 108°F. or higher.

The first session was brought to its close by a talk by Willie Crane, traffic attorney of the National Petroleum Association, "Oil Rates of the Future."

Joseph E. Pogue, consulting engineer, addressed the next session on the subject, "The Economic Lesson of 1928-29." He pointed out that the only additional ingredient needed in order to manufacture gasoline to meet, if not exceed, the demand, is an advance in the art of collective management. "If gasoline is not overproduced," he said, "the industry can make money, whatever the zealousness of the crude oil producer."

Henry M. Crane, technical assistant to the president, General Motors Corporation, gave a talk under the subject of "The Future of the Fuel Situation as Seen by an Automotive Engineer." He pointed to the fact that the automotive industry was doing a good job for the refining industry through the development of larger motors, operating at higher speed, and with greater power, and providing larger gasoline tanks—which the motorist seems to think he will not have to fill so often. However, with the increases in speed and power, the gasoline consumption per automobile is gradually and ever increasing throughout the country. Further, he stated, that this trend has really just started, and cited the recently announced 16-cylinder Cadillac. With larger cars, higher speeds, more and better highways, the consumption of gasoline and oil per motor vehicle is certain to increase steadily. He stated further that in his opinion there was little need for the refiner to worry over the preparation of a Diesel fuel for distribution to automobile drivers, since there is decidedly nothing to point to a widespread use of the Diesel engine in the motor car for many years to come. Diesel power, however, will become more widespread in its use in motor boats, yachts, airplanes and airships, primarily because of the greatly reduced fire hazard when such heavier fuels are utilized. Uniformity of motor fuels is still much needed by the automotive industry, despite the excellent progress made toward standardization of motor fuels in recent years.

THE CALIFORNIA SITUATION

Dr. George Otis Smith then addressed the convention in session on "The California Situation," stressing the importance of curtailment of crude production in that area, and stating that California admits having about 200,000 barrels over-production of oil daily. California's stored oil, he said, must be sold at a loss. One company is trying the interesting experiment of storing crude oil in an old depleted field, to avoid erection of expensive steel or concrete storage. Further, he stated that many California oil men agree that there is no money made in shipping California oil to the Eastern Seaboard.

In discussing the new gas conservation law in California, Dr. Smith said that it was brought into being by the oil men of the West Coast. He stated that the oil man has simply not been "gas-minded," having never attached any significance to the more or less accessory product. Any improvement found in the present attitude is directly due to the larger use of technical employes and the scientific information provided to management by their technicians.

In discussing the mutual agreement with regard to holding off in the Kettleman Hills fields, Dr. Smith told of an interesting incident occurring in 1907, when Ralph Arnold, geologist, took him to Kettleman Hills at that time, and foretold something of the greatness of this area at that early date. He impressed the audience with something of the magnitude of this immense field, yielding 59 gravity oil, 90 per cent. gasoline, from a depth of 7000 feet, and left little to the imagination as to what would happen to price structures in the event this area were speedily exploited and allowed to produce unchecked.

At the remaining session of the annual meeting, Ed. S. Hall, counsel, Standard Oil Company of New Jersey, presented an interesting discussion of "The Oil Industry's Code of Trade Practices." In discussing the code of ethics he analyzed and explained each of the rules. Copies of the code were presented to members present by the American Petroleum Institute. Mr. Hall stated that the code was based upon one important and fundamental economic principle, as summed up in Rule 17, which is as follows: "All refiners, distributors, jobbers, and wholesalers, shall conspicuously post, at each point from which they made delivery, the several posted prices of gasoline and kerosene, for each class of delivery for such deliveries at the time of delivery. Retailers and other operators serving consumers through service stations, garages, curb pumps, or pumps located at bulk plants, shall conspicuously post, at the place from which delivery is made, prices at which gasoline, kerosene, and motor oils are sold.

"No seller shall make any deviation from his posted prices (whether wholesale or retail) by means of rebates, allowances, bonuses, concessions, benefits, unusual credits, scrip books, or any plan, device, or scheme which may directly or indirectly permit the buyer to obtain gasoline or kerosene at a lower net cost to him.

"Commercial discounts, whether for delivery at service stations or otherwise, may be recognized as an exception to this rule in sections where they are now in vogue, but shall apply only to written contracts for charge accounts." This rule, Mr. Hall pointed to, as the most important in the code of ethics, and "strict adherence thereto will assure the success of the code and destroy the evils of uneconomic trade practices."

W. T. Holliday, president of the Standard Oil Company of Ohio, presented an interesting paper under the title of "Marketing Problems." A discussion of the work done by the division of public relations of the

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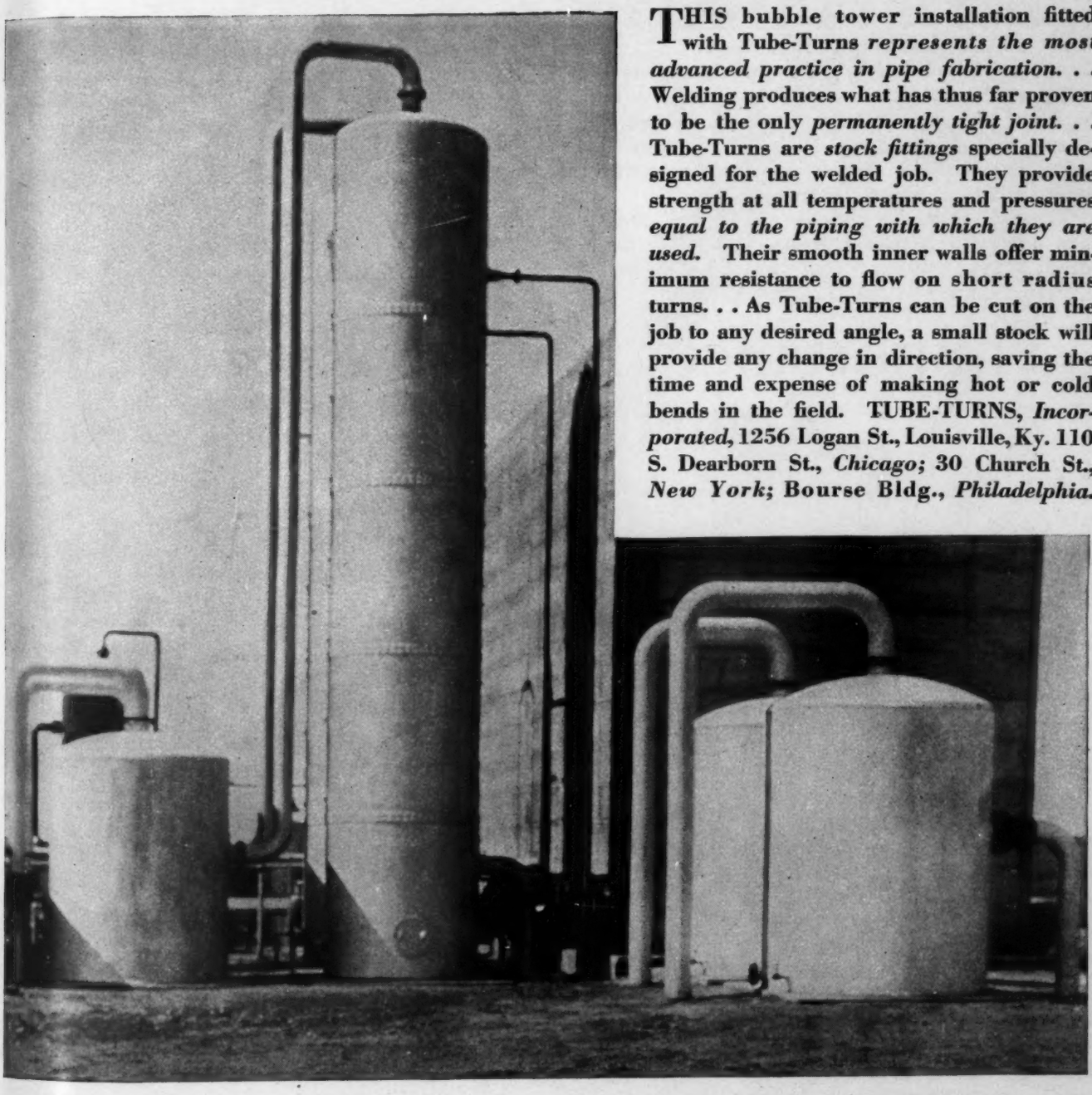

THIS bubble tower installation fitted with Tube-Turns *represents the most advanced practice in pipe fabrication.* . . Welding produces what has thus far proven to be the only *permanently tight joint.* . . Tube-Turns are *stock fittings* specially designed for the welded job. They provide strength at all temperatures and pressures *equal to the piping with which they are used.* Their smooth inner walls offer minimum resistance to flow on short radius turns. . . As Tube-Turns can be cut on the job to any desired angle, a small stock will provide any change in direction, saving the time and expense of making hot or cold bends in the field. TUBE-TURNS, *Incorporated,* 1256 Logan St., Louisville, Ky. 110 S. Dearborn St., *Chicago;* 30 Church St., *New York;* Bourse Bldg., *Philadelphia.*

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American Petroleum Institute was presented by Victor H. Scales, assistant director of the division.

TRUSTEES AND OFFICERS

The officers of the National Petroleum Association who served during the past year were all re-elected for the coming year. E. M. Lyons, Tiona Refining Company, is again president of the association. P. S. Tarbox, Independent Refining Company, first vice president, and N. H. Weber, Pure Oil Company, is second vice president; Fayette B. Dow, general counsel; Willis Crane, traffic attorney, and Herbert C. Eaton is recording secretary. E. W. Smiley is assistant recording secretary and G. B. Hunter is treasurer.

Fourteen of the trustees were re-elected, and seven new trustees were elected, giving the association a total of 21 acting trustees. The trustees are as follows: Fred G. Clark, Fred G. Clark Company; Sheldon Clark, Sinclair Refining Company; Earle M. Craig, Freedom Oil Works; G. C. Davison, Tri-State Refining Company; Frank B. Fretter, National Refining Company; T. J. Hilliard, Waverly Oil Works; W. T. Holliday, Standard Oil Company of Ohio; O. P. Keeney, Keeney Oil Company; H. A. Logan, United Refining Company; E. M. Lyons, Tiona Refining Company; A. W. Scott, Empire Oil Works; P. S. Tarbox, Independent Refining Company; N. H. Weber, Pure Oil Company; R. A. Wotowitch, Empire Oil & Refining Company; J. H. Rose, Bradford Oil Refining Company; O. D. Donnell, Ohio Oil Company; C. J. Leroux, Paragon Refining Company; J. H. Graham, Indian Refining Company; A. C. Woodman, Richfield Oil Corporation of New York; C. J. Sheffield, Standard Oil Company of New Jersey; W. V. Hartman, Gulf Refining Company.

Importance of Steam Energy In Refining Petroleum

By HERBERT A. ROSS

Co-operative Engineer to the National Petroleum Association

IN the year of 1849, or about a decade before the development of the famous Drake oil well at Titusville, Pennsylvania, a brewer in Manchester, England, by the name of J. P. Joule proved that a definite amount of work or mechanical energy is always equivalent to the production of a certain quantity of heat. In a large number of experiments wherein he made use of falling weights, transmitting by means of cords and pulleys the energy thus produced to paddles immersed in water, Dr. Joule determined that in order to raise the temperature of one pound of water one degree Fahrenheit, 772 foot pounds of work had to be done. At a somewhat later time, other scientists, with improved equipment, have increased the amount of mechanical energy required to 778 foot pounds and they have called this energy a British Thermal Unit, or in its abbreviated form, a B. T. U.

In the conduct of refining crude petroleum the production and utilization of heat energy, particularly in the form of steam, plays an indispensable part in the quality of the finished materials sold to the consumer. Regardless of this form of heat energy importance to the processes, however, the general attitude of everyone concerned either in its production or utilization often seems to be a passive endurance of the evil necessity to burn fuel.

Probably a B. T. U. is an insignificant thing in your estimation. The importance of the mechanical energy it represents to the engineer, however, has been of great value in the development of refining processes and economies. The department where this energy is produced in an oil refinery is the boiler house. Therein from 60 to 80 per cent of the purchased energy-producing material called fuel is consumed. This department is the heart of the plant and through its arteries of steam mains must flow volumes of heat fluid suitable for the processing departments. Every processing activity is absolutely dependent upon the quality of this heat to furnish either maximum or minimum volumes of profitable products.

We may spend a fair-sized fortune for the most modern fractionating equipment, controlled by every automatic device which human ingenuity can conceive. The profit we earn from such investment is dependent upon the adequacy and mechanical efficiency of the boiler plant. We will employ expert operators and pay them a good salary in order to obtain a maximum of efficiency from fractionating equipment. At the same time, we will install the cheapest labor obtainable to furnish the necessary quality of heat energy to operate this expensive fractionator.

BOILER EFFICIENCY "YARD STICK"

We will with daily regularity carefully scrutinize records and details pertaining to production and sales. May I ask how often we afford as serious an interest in the boiler plant?

At stated intervals we will obtain an inventory of stocks on hand and determine the losses we sustain in processing operations. We have studied records of this situation for so long a time now that we can instantly determine our standing in this particular. We follow this procedure because it is one of the "yard sticks" upon which we rely to predicate a profit. What about our fuel inventory? Have we ever

STRONG AS THE HILLS
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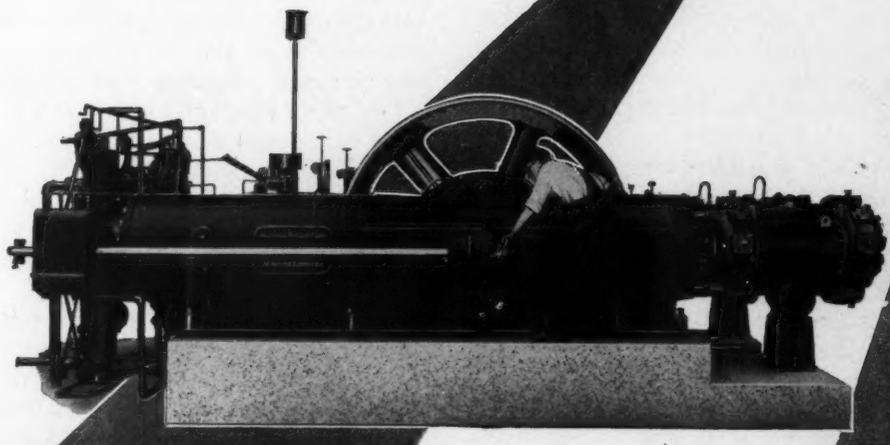

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attempted to carefully study this situation and determine the fuel loss we sustain? What "comparative yard stick" do we use to determine the efficiency of the boiler plant and its contribution to profit, or what corrective measures have we ever undertaken in this respect?

We invest thousands of dollars for a new filter plant that is a marvel of efficiency and point with justifiable pride to the model system of headers, valve controls, heat exchangers and conveyors whereby we are enabled to process at a peak of economy. Have we forgotten that our profits in this department derived from the quality of lubes, thruput capacity, clay virtue and diluent losses are absolutely dependent upon the heat energy product generated in that dingy, dirty place called a boiler room, which everybody seems to avoid, and operated by an underpaid attendant left principally to his own devices? This individual's knowledge of economic combustion procedure does not, as a rule, extend beyond the certain assurance that, using his own vernacular, "He will ketch Hell if he does not keep the pressure up", regardless of how much fuel he must burn to do so.

I Icould extend my criticism of wasted steam heat energy into every department we have, and prove the loss we sustain. We take a pardonable pride in emphasizing the fact that we manufacture a product par-excellence, with the most modern and efficient equipment that money can buy. Is our zeal equally profound in regard to the boiler room? The occasional visitor will be afforded a personally conducted tour through every department of the refinery, but the place that produces the life-giving energy which activates all the beautiful equipment is so dejected and unwholesome that we try to avoid it.

Have you ever seen a picture in graphic form of the heat energy you have purchased, produced and consumed, plotted against your thruput over a daily or a monthly period and if you have, can you correctly interpret its significance? Or do you advance the same old argument I so often encounter that runs something like this: "We are not at all interested in saving a few pounds of coal per barrel if we can obtain a volume thruput"? Considered solely from the standpoint of a few pounds of coal, the refutation may be a sound one, but when you think of the heat energy which a few pounds of coal represents, this alibi has no validity as an apology for a waste that can be avoided by an intelligent investment of money and effort.

FUEL COST DIFFERENCES

I am willing to admit that figures can be juggled in such a manner as to be very misleading, but when they are based on known facts proved to be true, and then assembled in comparative or statistical forms, certainly no one can question their value. For instance, why is it that in two refineries processing similar crudes and producing the same material, the fuel and labor cost to one is 15 cents per barrel of thruput, while the other sustains a cost of 30 cents or more? Why is it that one boiler plant will evaporate six pounds of water per pound of coal and another 10 pounds of water on the same amount of a given fuel? Why is it that one plant is consuming eight boiler horsepower per barrel of thruput while the other uses 20, 30, or 40 for the same purpose? Why is it that one plant is consuming one pound of fuel per gallon of thruput and the other two pounds? One or the other of these plants may be yours. These questions are pertinent ones, but the total amount of profit you obtain is largely dependent upon the serious attention you afford such problems.

Contrasted with the present day knowledge and experience in the art of petroleum refining, our procedure of just a few years ago seems to have been rather inefficient and antiquated. We may reasonably anticipate the possibilities that five years hence our present practices will be just as out of date. Thus the bugbear of obsolescence affords a continuous menace to our profits. We no sooner spend thousands of dollars to satisfy the market demand for high grade motor gases and lubricants than we again hear the cry, "Improve your processes further, for we must have still better materials than you have heretofore furnished".

The refiner has always kept pace with the demand in the past and will undoubtedly do so in the future, but while he is going through this transition of improved methods, he has often been forced to take a so-called "gambler's chance" in the choice of expensive equipment which he purchases. He is faced with a necessity to consider many contradictory expensive new ideas and theories pertaining to his processing activities that completely upset any and every old refinery tradition with which he is familiar.

IMPORTANCE OF BOILER PLANT

Now, in all of this maze of contradiction and speculation pertaining to the fractionation of petroleum, I want to direct your serious attention to some fundamental facts which are all too frequently forgotten. Underlying the whole procedure of refining from the very beginning, it has always been necessary to make use of mechanical energy in the form of steam produced in a boiler plant, and practically every improvement which you have ever made in your plants has always been and probably always will be dependent upon this essential element, whether you have thought of it in that light or not. Operating a plant under the earlier method, heat was produced at comparatively low temperature levels both at the stills and the boilers. Steam pressures ranged from 50 to 75 pounds gauge in the boiler house. Under the stills heat would be applied at low temperature levels and as the various fractions were distilled off, the temperature in the furnaces would be gradually increased in conformity with the

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vaporizing temperatures of the different fractions until the desired residum was obtained.

Modern distillation must still use this faithful old standby of steam heat energy, and it only differs from former processes in that the steam heat is applied at higher temperature levels and shorter time intervals. Perhaps I can better illustrate the situation by a use of the following illustration:

It can be proven that five gallons of sea water contains as many heat units as there is in a pound of steam at 300 pounds pressure, but this fact would not be of value in the process of petroleum refining. The older refiining methods are analogous to the sea water in that low heat levels were spread over prolonged time intervals; the newer methods conform to the 300 pound steam temperature, or a highly concentrated heat energy effected by close confinement within limited time intervals.

A unit of heat energy is the same under any and all conditions, whether it is contained in melting ice or the tremendous heat of the sun. The only means by which we are enabled to avail ourselves of such energy, however, is by a series of temperature reductions founded on the well-known principle that heat can only flow from higher to lower levels of temperature, and during these temperature reductions to extract a certain amount of energy from the various temperature level drops or steps.

In all heat problems a very important factor is the element of time which interposes as changes in temperature levels occur. Thus, generally speaking, the greater the difference in temperature levels and the shorter the length of time in which the change occurs will definitely determine the heat econimies we derive in our processing activities. The economy in operation and the quality of products which are afforded by the methods of flash distillation are all founded on the foregoing principles which I have just named.

HEAT ENERGY CONTROL

Cold crudes flowing to a tube still are first preheated by passing them through a series of heat exchangers which are nothing more than an apparatus designed to transmit the high latent or sensible heats of vapors and liquids that have been contained in the fractions of a distillation tower to the lower level entering crude temperatures. Here we have an illustration of the heat flow from a high to a lower temperature level, as well as the accompanying time element. After the preheated crude from the exchanger enters the tube still a temperature difference and time interval again occurs whereby heat is rapidly transmitted from the furnace to the entering preheated crude, which is then expanded into the fractionating column. In this fractionating tower we again depend upon the difference in temperature levels affording by a series of rectifiying trays and superheated steam to assist in the process of fractionation. Regardless of how elaborate the equipment may be, we are inevitably forced to face the fact that the success of the whole device is founded on the control of heat energy and time intervals.

For some unknown reason which I have never been able to determine, when the subject of high steam temperatures and pressures is mentioned, everyone, particularly in the refining industry, seems to be fearful of some sort of an unknown danger. We don't "bat an eye" at a hot oil temperature of 800 degrees Fahrenheit under a pressure of 300 pounds in our fractionating equipment, but let me even refer to a steam temperature of 800 or 900 degrees and a pressure of 300 or 400 pounds, and everyone holds up their hands in holy horror.

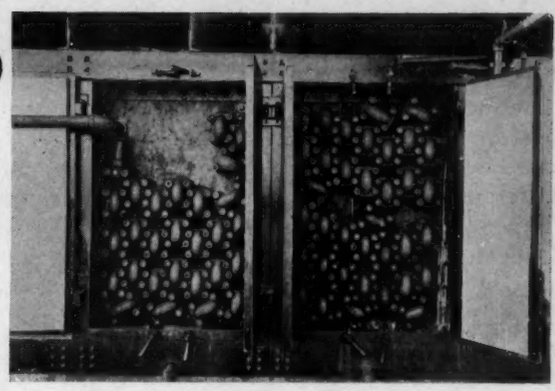
It seems but a few short years ago when I was called in on a large refinery power problem where they proposed to carry a pressure of 200 pounds on the boilers and distribute the steam from a central plant. This was an entirely new departure in refinery practice and had failed to live up to expectations during the initial runs. Everyone concerned in the project seemed to have a bad case of cold feet because it upset all of the old traditions pertaining to refinery boiler houses. All sorts of objections were raised to the high steam velocities, pressures and temperatures it was proposed to maintain throughout the system, and the most violent objection of all was afforded from the fact that we proposed to superheat exhaust steam with waste still flue gases to a temperature of 600 degrees and use it in the still sprays. The whole refinery scheme was a new idea and an improvement on the older method, and I believe that most of the difficulties occurred solely for the reason that "It had never been done before".

LACK OF CONSISTENCE IN CHOICE EQUIPMENT

I repeat again that the boiler room is the heart of your plant, and every department will function economically only to the extent that your boiler plant is efficient. We have been tremendously aroused over fractionating and other processing difficulties and have spent unlimited amounts to improve our methods. Equivalent consideration as a rule has not been afforded this heart of the plant. If it is necessary to secure manufacturing economies with new fractionating equipment, I submit that it is just as essential to rehabilitate the boiler plant. If economy has been afforded from this new fractionating undertaking, equivalent values can be obtained from the modern boiler department operated as intelligently and as skillfully as the fractionating equipment is.

Wouldn't it be a ridiculous proceeding to purchase the latest model Packard automobile without a motor and then hitch a yoke of oxen to it to furnish the motive power? Certainly, the oxen could produce all of the necessary energy to move the automobile and probably have a lot of power to spare. The power they represent, however, is not adaptable,

COMPLETENESS OF DESIGN



Seco Bends permit close tube spacing as in the connection section of this large cracking still.

The design of Seco Bends incorporates four major features that are combined in no other fittings.

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Seco Bends are locked to the tubes by simply tightening four nuts. They can be installed for a fraction of the cost of other fittings as the skilled labor, time and equipment necessary for rolling-in tube ends is eliminated.

Tubes machined for Seco Fittings are supplied by any of tube manufacturers.

There are but two joints for each fitting so that leakage is largely eliminated, and if it should occur, it can be easily stopped by tightening the nuts. Seco Bends are designed to meet your requirements. Prices or further data will be furnished promptly. Address your inquiry to either office.

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suitable or economical to activate such a fine piece of equipment.

Let us look at the picture in reverse order and consider the old ox-cart. Suppose we were to activate it with a motor. Sure! the old equipment would rattle and bang and groan, but we would get somewhere with it just the same; we would do it economically too, and figuratively speaking, we could get our products to market in quicker time and better order. This illustration is similar, in effect at least, to many of our refineries today. The old boilers are the oxen of the plant. Power? Energy? Certainly they have, but it is too slow to properly activate our modern equipment and processes, thus loss is bound to occur.

Now let us briefly consider the obsolescence hazards to investment in fractionating equipment. We may purchase an expensive apparatus and find that before we have it installed, an improvement or a modification of process has meanwhile been made that will supersede our new undertaking. This situation has occurred and will probably continue to be an unavoidable menace of our profit.

There is only one department in the refinery where such a critical situation does not exist, this is your boiler plant. I would not have you understand that the apex of economy and design has been attained in the steam generating phase of the engineering field, by any means. At the same time, we have the definite assurance that for years to come our cheapest source of steam heat energy will be fuel, either in solid, liquid, or gaseous form. We positively know that it is not possible to extract more energy than the fuel contains. We know of the pressure and temperature limitations which dare not be exceeded. We are practically certain that for years to come the most economical means of transporting purchased heat energy will be via the medium of steam. Finally, we have reached a point in the art of economically producing steam heat energy, where the hazard of obsolescence is not afforded by better or superseding methods. The only hazards affecting the boiler plant investment are the years of useful and economical service they will produce. Thus on this basis the return of our investment in this department is an assured one, and the possibility of early obsolescence becomes a minor one.

One other short reference again to the team of oxen before the closure of this paper. Suppose as you sit in the beautiful limousine drawn by the oxen that your chauffeur was the old ox driver with his long goad and loud exclamations of, "Gee—Haw—Whoa--Back". It would take some time to arrive at your destination, wouldn't it? Supplant the old driver with a uniformed, snappy mechanic who knew his business, and what would he do? Well, it would be a safe bet that about his first procedure would be to put a chestnut burr under the oxens' tails, and reinforce this with a strong injection of ginger solution in order to activate the motive power and obtain a little speed. Reverse this situation again and place the ox driver behind a modern motor and contemplate, if you will, the indifferent result you would obtain. Now, waiving any invidious comparisons of mine, apply this illustration to the present boiler rooms and the general situation existing therein, and render a decision as to whether or not your equipment is correctly chauffeured, so as to properly serve you and afford a full measure of economy.

In conclusion, permit me to present a brief picture of what I believe the modern refinery boiler plant should be. This plant will generate steam at pressures of 400 pounds or greater and at temperatures of from 600 to 900 degrees Fahrenheit. This superheated steam will first be passed through turbines and electrical power will be produced by extracting a small amount of thermal energy. It will then be transmitted at high velocities to the various departments through small mains and there expanded to the pressures and temperatures required for the different processes. Steam will be exhausted from pumps, etc., to accumulators which will store the unused energy until it is required for those processes that will require lower pressures, such as the filtering department. This procedure can be made to afford a balance and conservation of heat energy within definite limits of economical operation. This is not a visionary picture, by any means, for such arrangements are being successfully and economically operated in a number of other industries today.

I have endeavored to afford you a few reasons why it will cost some refineries 30 or 40 pounds more coal per barrel of thruput than it does others, if they do not afford the required consideration to the boiler plant. It is not a question of the value in fuel saved so much as it is a conservation of the value in heat energy which is represented by this amount of fuel, applied in such a way as to afford a maximum volume of quality product that will return the greatest profit. These changes will be costly, and in order that the plant may be successfully operated and afford a decent return on the investment, your entire procedure must be directed and controlled by the equally efficient services of an intelligent and practical engineer who is entirely familiar with every phase of this most complex business of producing heat energy for processing petroleum.

If all gasoline were Dubbs Cracked Gasoline refiners would have less cause for worry and would score a complete knock-out

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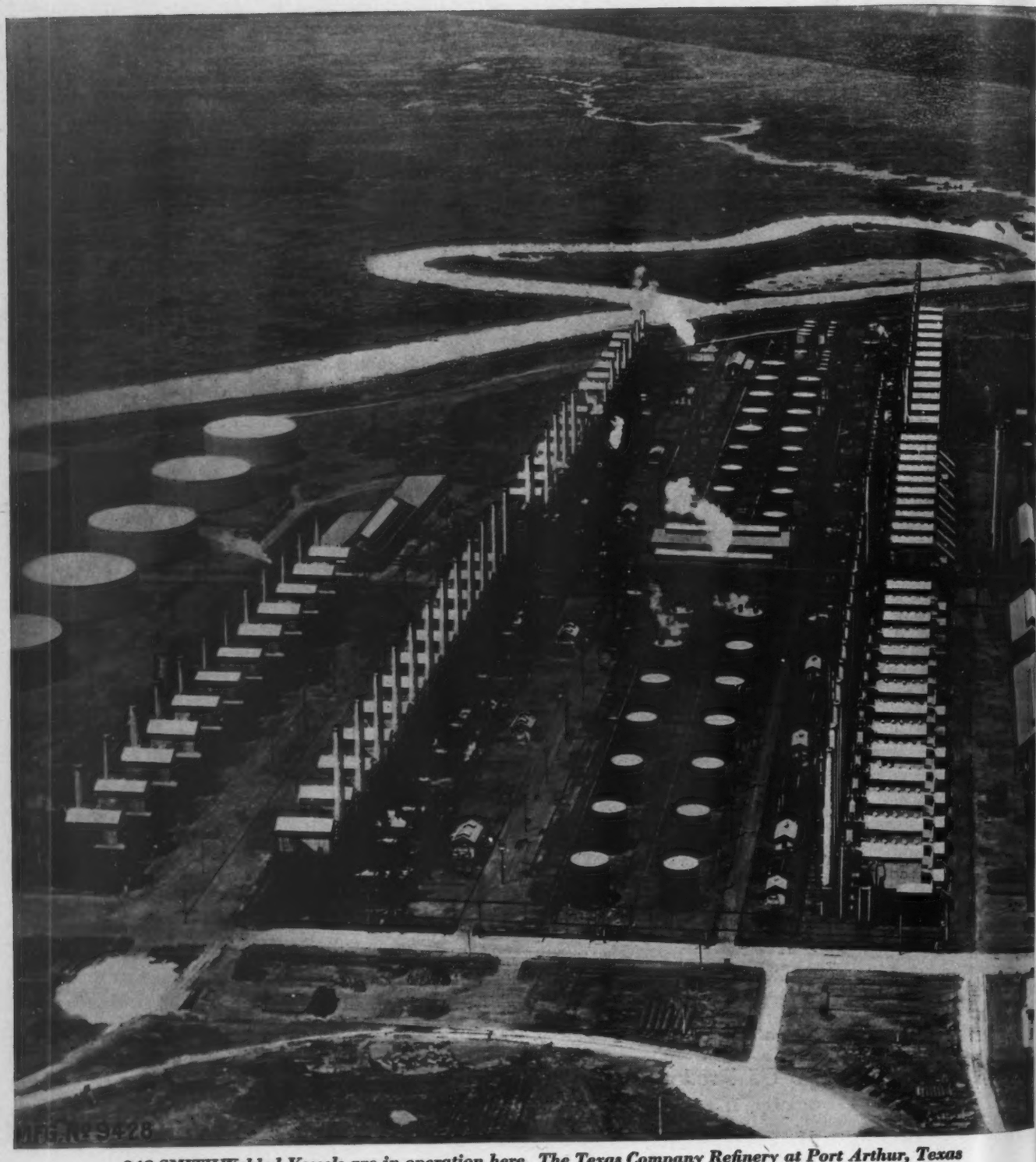
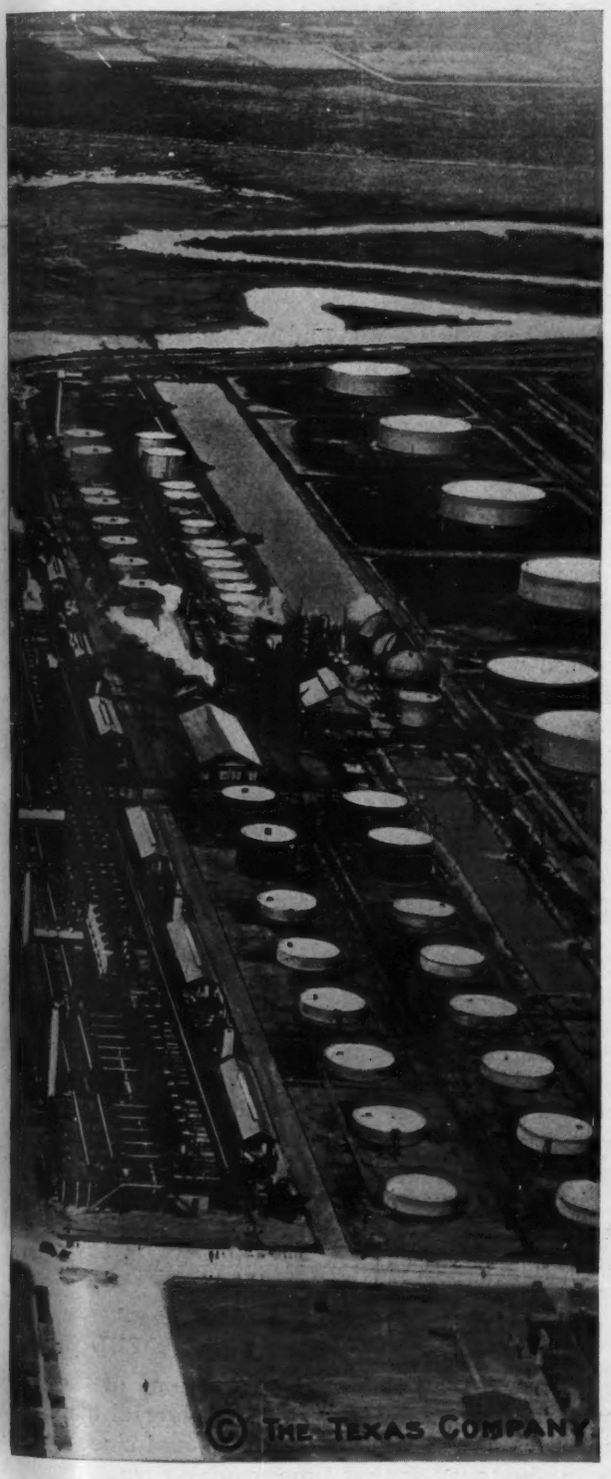


248 **SMITH***Welded Vessels are in operation here. The Texas Company Refinery at Port Arthur, Texas*

SMITH *WELDED*

THAN 950



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PROCEEDINGS OF THE NATIONAL PETROLEUM ASSOCIATION

"Determination of Oil In Paraffin Wax"

An Address prepared by DR. D. P. WELD, Standard Oil Company, New York,
and Delivered by DR. J. B. RATHER

PETROLEUM consists of a complicated mixture of hydrocarbons which range in nature from individuals which are liquid or gaseous at ordinary temperatures to others which are solid under the same conditions. Since the usefulness of paraffin wax depends upon its high melting point as compared with oil, paraffin wax may be roughly defined as a mixture of those hydrocarbons of the paraffin series which are solid at ordinary temperatures.

When wax bearing petroleums are distilled, the wax is carried over with the oil when sufficiently high temperatures are reached. This is equivalent to saying that there is no sharp distinction between paraffin wax and its normally associated oil as far as boiling point is concerned. There are, however, several characteristics in which paraffin wax differs considerably from oil, notably, melting point, solubility in various solvents, and refractive index. All of these differences in the properties of oil and wax have been used in one way or another in the analysis of mixtures of oil and wax.

When a wax bearing distillate is chilled, a portion of the wax separates out in solid form, and a partial separation of the oil and wax can be accomplished by the purely mechanical process of pressing. A further separation of the oil and wax can be accomplished by sweating. In this process, the mixture of oil and wax is maintained at a temperature silghtly lower than the melting point of the mass, and the oil entrained within the wax is allowed to run along with a portion of the lower melting wax. During the sweating process, the melting point of the unmelted portion of the wax, as well as the melting point of the wax-oil mixture which runs off, gradually rises. Sweating is seen, therefore, to consist of a fractionation process which is analogous in some ways to distillation. Sweating is more effective than distillation in the separation of oil and wax because of the greater difference between the melting points of oil and wax than between the boiling points.

If the sweating process is carried on long enough, and to a high enough temperature, paraffin wax can be produced which is practically free from oil. It is in the control of the various steps in the separation of oil and paraffin wax, as well as in the evaluation of the wax for its various uses that methods for determining the oil content of wax find use.

OIL-WAX MIXTURE ANALYSES

Numerous methods have been proposed and used to a greater or lesser extent in the analysis of oil-wax mixtures. All of these methods suffer from the lack of sufficient distinctness between the properties of oil and paraffin wax, as well as from the variation of the properties of oils and waxes derived from different sources. In the following, a general survey of the methods available for the determination of oil in paraffin wax will be made and some comment made upon the good points, faults, and particular applicability of the various methods.

The press method for determining oil and moisture in paraffin wax is perhaps the oldest method in use. This method has been described by various authors (1) but it had been in use many years before an effort was made by any recognized body to standardize and perfect it. In using the press method it is assumed that the wax to be analyzed consists of a mass of wax in which the oil is mechanically entrained and that the oil can be squeezed from the wax by the application of pressure.

In general, the press method consists in placing the wax sample between disks of cloth, the cloth-wax "sandwich" thus formed being included, in turn, between disks of blotting paper. The whole assembly is pressed between metal platons at a pressure of several hundred pounds per square inch. After pressing, the weight lost by the wax, which is taken to represent the oil and moisture content of the wax, is determined by weighing the whole sandwich, or by scraping the wax from the cloth and weighing the separated wax. The results of determinations made by the press method depend upon numerous factors among which may be mentioned, the melting point of the wax, oil content of the wax temperature at which the pressing is made, the nature of and blotting paper used, and the humidity of the air at the time the test is made.

PRESS METHOD UNSUCCESSFUL

In spite of the obvious imperfections of the press method, it has come into almost universal use in the industry. Since this was the case, and since no better method was at that time available, the American Society for Testing Materials, through the agency of its Sub-Committee 111, of Committee D-2 on Petroleum Products and Lubricants, undertook to standardize the method. In 1922 the sub-committee offered a report to its senior committee which embodies a suggested standardized procedure for the test. (2) It was finally agreed that the press method

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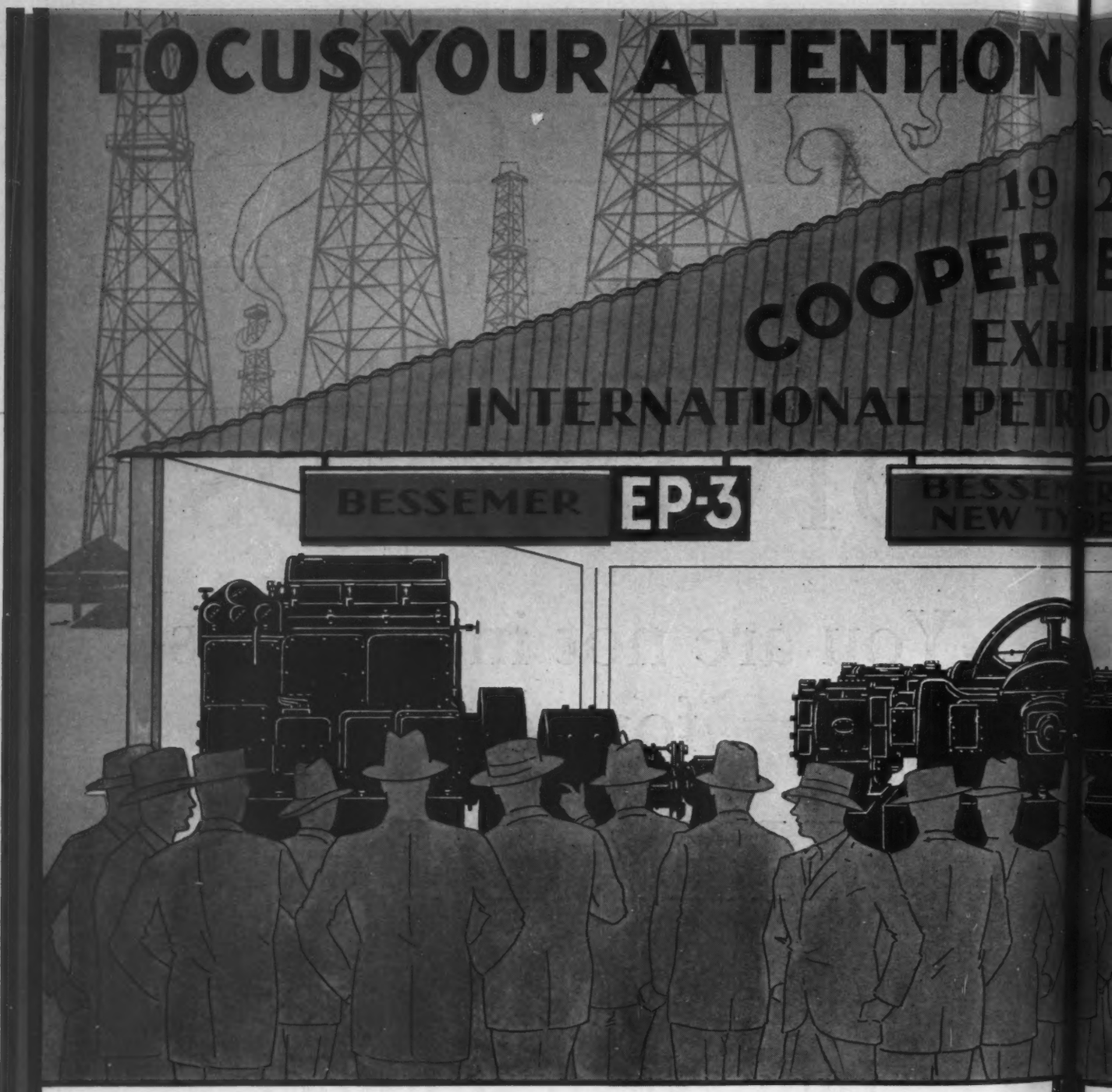

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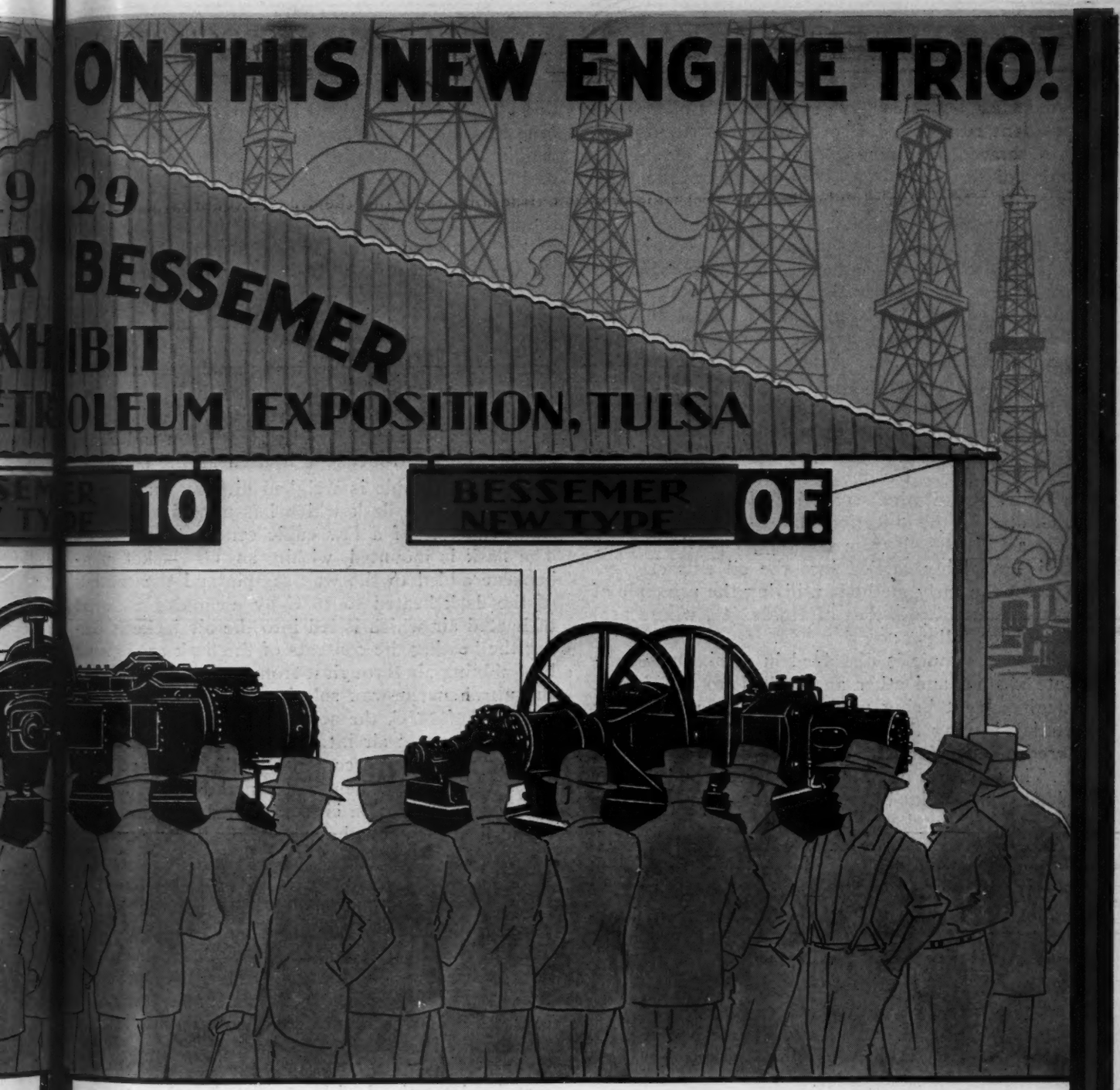

Nearly as important as the main engines, are the auxiliary power units. The dependable performance of Bessemer Type-EP-3's has established their reputation for this service. The engine, which is a full Diesel, direct drives the electric generator. This unit will be new to many oil and gas field men.

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was hopeless because of the impossibility of getting concordant results and also because the results obtained showed no direct relation to the actual oil content of the wax. (3) This ended, for the time being, the attempt to standardize the press method for determining oil and moisture in wax.

In turning from the unsatisfactory press method, several procedures have been devised in which a more or less sharp separation of oil and wax is obtained by the use of solvents, such as absolute alcohol-ether mixture, ethyl acetate, benzene, light gasoline and nitrobenzene. A perfect solvent for this purpose would be one in which the wax is practically insoluble and in which the oil is very soluble. Such an ideal solvent has not been found but there are several which, under carefully controlled conditions, give fair results. The methods which depend upon the actual quantitative separation of the oil and wax are all open to the objection that, although it is easy to extract all the oil from the wax, a portion of the wax is invariably carried into the oil extract.

One of the early methods utilizing the principle of selective solubility is that of Holde (4), whose procedure is as follows:

The wax sample is dissolved in a mixture of absolute alcohol and ether and colled to 20°C, just enough solvent being used to dissolve all the oily material, leaving the wax undissolved. The was is filtered off in a funnel which is chilled with ice and salt. The filtrate is freed from the solvent and the oily residue thus obtained is again extracted as described above. The second crop of wax obtained in this way is combined with the wax obtained in the first extraction. The combined wax is washed with the cold solvent, freed from solvent, and weighed. The amount of oil present in the sample is then determined by difference.

The method of Holde is tedious and inconvenient because of the necessity of working at low temperatures. Furthermore, because of the appreciable solubility of the wax in the solvent, the method is satisfactory only for waxes containing oil and wax in quantities of the same order.

An obvious improvement upon the method of Holde would consist in the use of a solvent which would produce an acceptable separation of oil and wax when used at ordinary temperatures. Such an improvement is embodied in the method proposed by Wyant and Marsh (5). These investigators made an exhaustive study of a number of solvents with the result that acetone, to be used at 60° F, was found to be the most effective. The procedure of Wyant and Marsh is briefly as follows:

The wax sample is dissolved in acetone, the solution brought to exactly 60°F, and filtered. The paraffin wax left upon the filter is washed with acetone, freed from the solvent, dried and its melting point determined. If the melting point of the wax is abnormally high, it is an indication that the extraction has removed too much wax along with the oil. In this case, the oil separated is again treated with acetone at 60°F and filtered, and the recovered oil weighed. If, on the other hand, the melting point of the wax is too low, thus indicating incomplete extraction of the oil, the wax is again extracted and the material removed combined with the oil obtained in the first extraction. Like the method of Holde, this method is not suitable for waxes containing small percentages of oil.

Aside from the difficulty of obtaining a sharp separation of oil and wax by means of solvents, the two solvent methods described are objectionable because of the necessity of the quantitative handling of solutions and wax or oil residues. An ingenious method has been published by Henderson and Ferris, (6) in which nitrobenzene is used as the solvent.

The wax sample is weighed directly in a small round bottomed flask which has upon its bottom a small tubercle of a few cubic centimeters capacity. The flask is mounted within an air jacket, nitrobenzene added to the wax sample and the contents of the flask heated to 70°C by means of a current of heated air which is led into the air jacket. During the heating the contents of the flask are agitated by bubbling air through it from a glass tube. When the nitrobenzene-wax solution has reached a temperature of 70°C, the solution is cooled to 32°C by introducing cold air into the air jacket. During the cooling process, the contents of the flask are vigorously agitated. When a temperature of 32°C is reached, the agitation is stopped and the wax will be found floating upon the surface of the nitrobenzene-oil solution.

The nitrobenzene-oil solution is sucked from the flask by means of a fine glass tube, and the wax crystals are left, for the most part, clinging to the sides of the tubercle on the flask. A second portion of nitrobenzene is added and the whole procedure repeated. The wax left in the flask after the second extraction is freed from nitrobenzene by heat and suction, and the weight of the wax determined by weighing the flask. The melting point of the wax may be determined without removing the wax from the flask. This method is said to give good results when applied to slack waxes which contain upwards of 35 per cent of oil. The authors do not explicitly recommend the method for use on waxes containing small percentages of oil.

The next development in the art of analyzing wax-oil mixtures, particularly those mixtures containing small percentages of oil, takes the form of a method by which a partial separation of the oil and wax is effected by means of a solvent, the oil-wax mixture removed by the solvent being thereafter analyzed by making use of the rather wide differences in the refractive indices of waxes and their normally associated oils. This procedure is used in the method devised by Wilson and Wilkin (7).

If a wax of known index of refraction is dissolved

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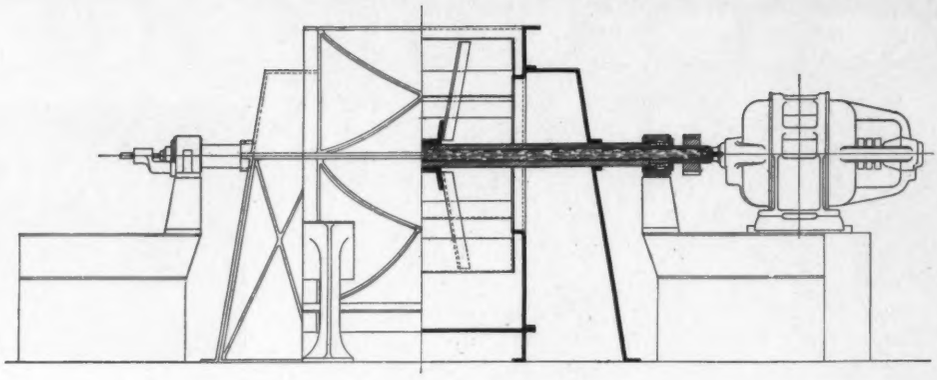

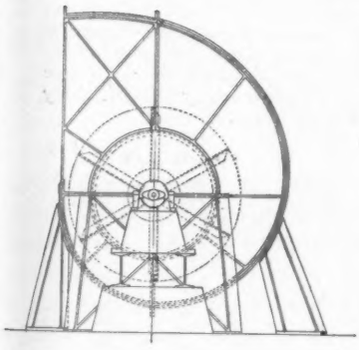

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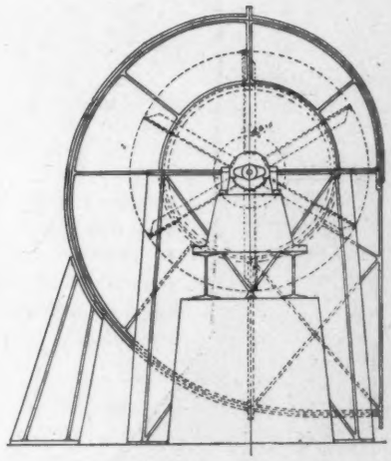

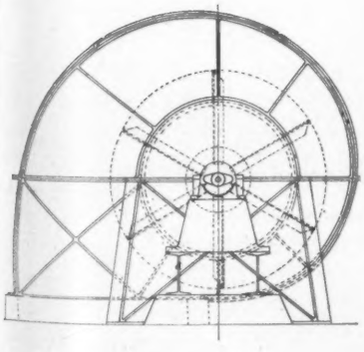

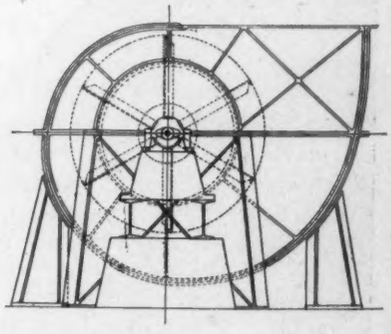

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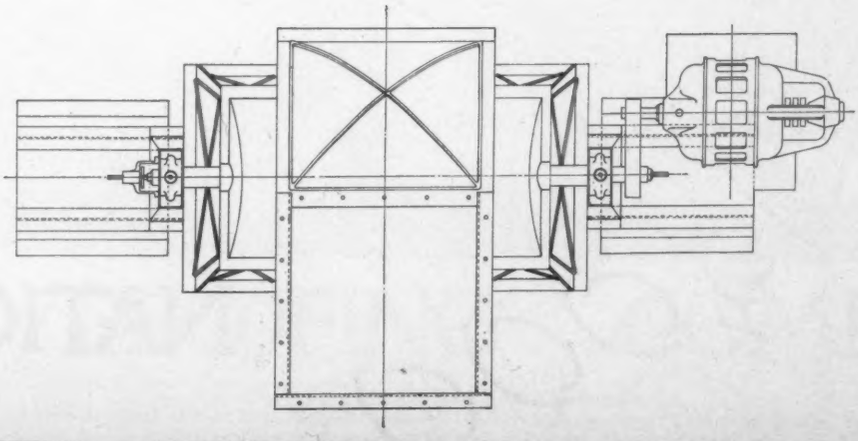

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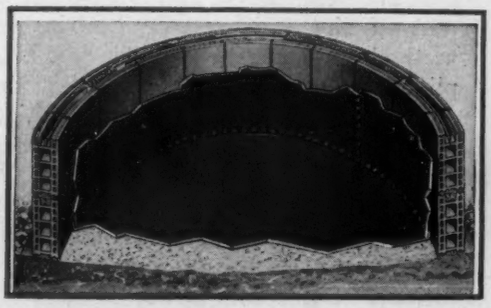
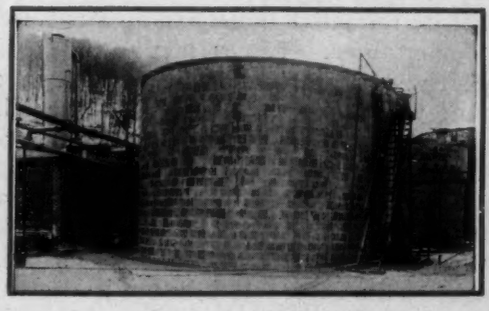


Cross-section showing two courses Segmen-Tile. Note curvature in wall. Ends are cut to any radius depending on diameter of tank.



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in various proportions in an oil of known index of refraction and the refractive indices of the mixtures determined, a curve can be plotted which will show the relation of the refractive indices of the mixtures to their composition. By means of such a curve, unknown mixtures of oil and wax can be analyzed by the simple expedient of referring the refractive index of the unknown mixture to the curve. This, broadly, is the principle by which the refractometer is used in the method of Wilson and Wilkin for determining oil in paraffin wax. The principle is applied in the following way:

The wax sample is dissolved in ethylene dichloride, the solution chilled to O°C, filtered, and the precipitated wax washed, and the combined filtrate freed from ethylene dichloride by evaporation. The oil-wax residue from the solvent is assumed to contain all the oil in the original sample along with an approximately equal amount of soft wax. Wilson and Wilkin show that for a given crude source, and for paraffin distillates of a similar boiling range, the indices of refraction of pressed distillates derived therefrom are nearly constant. The pressed distillates are assumed to be identical with the oil which is to be found in oil containing paraffin waxes. It is also shown that the refractive indices of the waxes which are separated by extraction along with the oil are also reasonably constant. These two assumptions are utilized in the analysis of the oil-wax residue separated from the wax sample by means of the ethylene dichloride.

A "reagent oil" which has the same refractive index as the wax extracted along with the oil is prepared by blending. The oil-wax residue is dissolved in the smallest possible amount of the reagent oil and the whole weighed. Since the reagent oil has the same refractive index as the wax contained in the oil-wax residue, the addition of the reagent oil has the same effect upon the addition of more of the wax to the mixture. However, the addition of the reagent oil has brought the mixture to a liquid condition such that its refractive index can be measured at ordinary temperatures. The refractive index of the mixture which now contains the oil from the wax sample, the soft wax extracted along with the oil, and the reagent oil, is now determined, and the percentage of oil from the wax sample is determined by referring the refractive index of the mixture to a curve which has been experimentally developed for mixtures of pressed distillate and the reagent oil. Since the weight of the three-fold mixture is known, the actual amount of oil from the sample can be calculated.

REFRACTOMETRIC METHOD

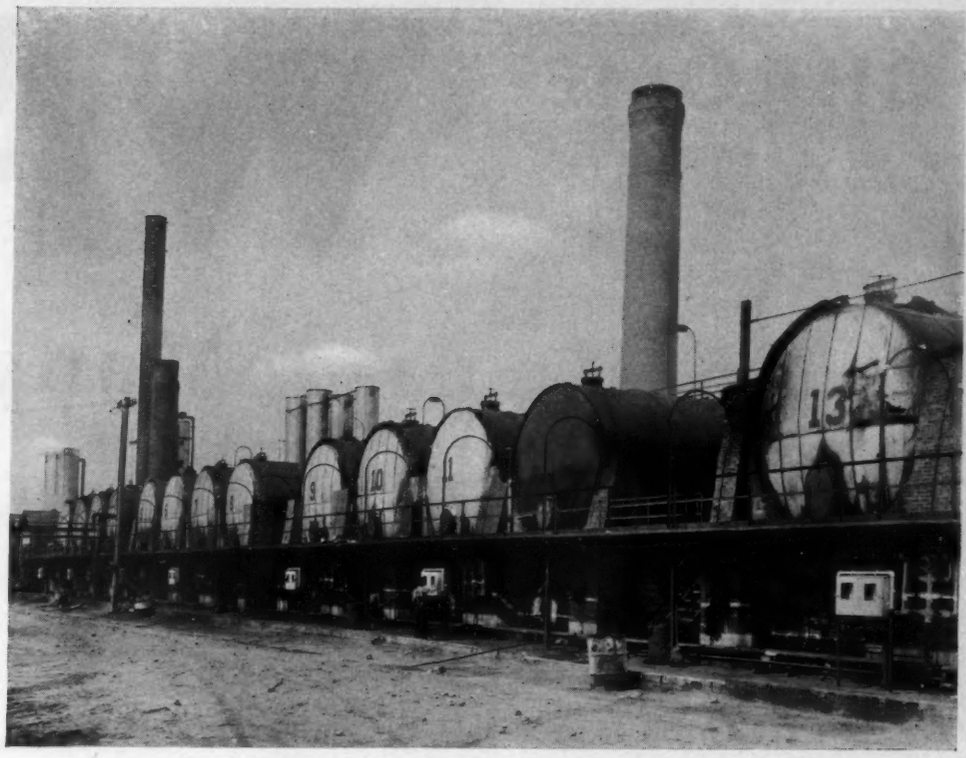
The method of Wilson and Wilkin was studied by the American Society for Testing Materials but it was finally abandoned. The weakness of this method lies, aside from the tedious procedures necessary, in the fact that it is necessary to know the index of refraction of the oil in the sample and of the wax which is extracted with the oil. The universal application of this test would require the compilation of refractive index data for all crudes. Obviously the preparation of any such body of data is out of the question.

A refractometric method for determining oil in paraffin wax which lends itself well to routine work has been described by Diggs and Buchler (8). This method utilizes an adaptation of the simple procedure already mentioned by which the composition of oil-wax mixtures is determined by referring the refractive index of the unknown mixture to a curve which shows the relation between refractive index and composition. The principle feature of this method is the way in which the refractive indices of the oil-free wax and wax-free oil components of the wax samples are determined.

It is shown that filtration of waxes containing small percentages of oil through Attapulgus clay will quantitatively remove the oil without appreciably effecting the wax itself. A study of deoiled waxes prepared in this way showed that there was considerable variation in the refractive indices of the waxes, even though they were of the same melting point and derived from identical crude sources.

Pressed distillates of similar boiling range and derived from similar crude show refractive indices which vary systematically with the cold tests of the oils. The lower the cold test of the oil, the lower is its refractive index. It is assumed that a pressed distillate of very low cold test is substantially free from wax and that such an oil is identical with the actual wax-free oil which would be associated with the wax in the sample. A low cold test distillate is accordingly taken to represent the oil component of the wax sample, while an oil-free wax is prepared by filtration of the sample through clay as already mentioned.

In making the analysis, the refractive indices of the wax sample, the wax-free oil and the oil-free wax are determined, and from these data the oil content of the wax sample can be calculated. The method as actually carried out is somewhat simplified, however, by the fact that the refractive indices of the low cold test pressed distillates obtained under the rather stable conditions to be found in a given plant vary so slightly, that for routine work they may be considered to be constant. Hence, the refractive index of the oil component of the wax may be determined once and for all for a given set of conditions. Since this is the case, it is only necessary to determine the indices of refraction of the wax sample and of the oil-free wax derived from the sample by filtration. Under these conditions, the data habitually handled would be the assumed constant index of refraction of the wax-free oil, and the experimentally determined indices of the oil-free wax and of the wax sample. The calculation of the oil content of the sample can be made mathematically, but the calculation is more easily made graphically



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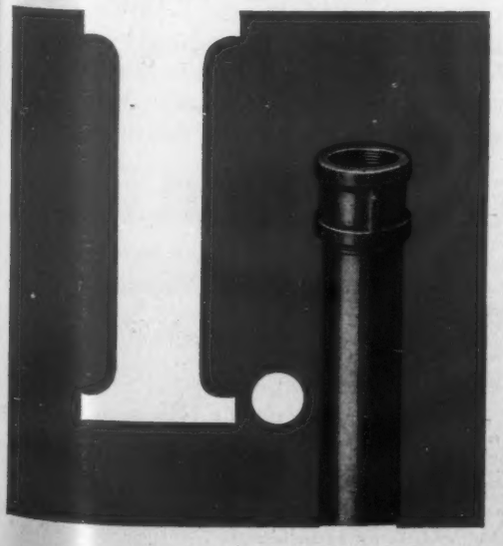

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SOLIDIFICATION-POINT METHOD

In applying this method to the analysis to crude scale and slack waxes, it is necessary to reduce the oil content of the sample to about 2.5 per cent by pressing or extraction before the oil-free wax can be produced from it by filtration. It is stated, however, that in ordinary routine work, it is necessary to prepare the oil-free wax only occasionally.

The direct refractometric method appears to be well adapted to plant control work where speed is required and where the materials handled are substantially uniform and of known characteristics. It is obvious, however, that the method would not be satisfactory where waxes of varied and unknown origin are to be analyzed.

A method for determining oil in wax which represents an effort to devise a procedure which will be universal in application in that each determination stands by itself without any particular reference to the source of the material to be examined, is the solidification point method (9). This method makes use of an oil-wax residue which is obtained from the sample by extraction with ethylene dichloride. The weighed oil-wax residue is dissolved in a weighed amount of a reagent oil of known solidification point and the solidification point of the mixture determined. The solidification point of the reagent oil will obviously be raised by the wax contained in the oil-wax residue. It is assumed that the oil contained in the residue is without effect upon the solidification point of the reagent oil.

If a calibration curve were available which would show the effect of various concentrations of the wax contained in the wax-oil residue upon the solidification point of the reagent oil, the wax content of the mixture of the reagent oil and the wax-oil residue could be readily determined. Such a calibration curve is obtained in the following way:

It is shown that successive portions of wax removed from the sample by repeated extraction with ethylene dichloride are identical in effect upon the solidification point of the reagent oil. Hence, after the oil has been extracted from the sample, a second extraction is made by which a sample of oil-free wax is obtained which is identical with the wax contained in the oil-wax residue. This oil-free wax is used along with the reagent oil to construct a calibration curve which will show the solidification points of various concentrations of wax in the reagent oil. The percentage of wax in the mixture of reagent oil with the oil-wax residue is obtained by referring the solidification point of this mixture to the curve. Since the total weight of the mixture is known, the amount of oil present may be calculated.

MODIFIED PRESS METHOD

The solidification point method has been found to give accurate results only in the hands of experienced operators, but the tedious nature of the procedures required eliminates the use of the method in routine work. This method was studied by the American Society for Testing Materials but it was finally dropped from consideration for the reasons given above.

The American Society for Testing Materials has recently adopted as a tentative method a modified form of the old press method (10). The tentative method as it now stands calls for the use of small disk shaped samples of wax which are made by pouring melted wax into a mold. The samples are weighed in closed weighing bottles, along with two carefully dried cloth disks. The cloth-wax sandwich is included between layers of filter paper and pressed at a pressure of 1000 pounds per square inch between metal platens through which water circulates in order to maintain the platen assembly at 60°F. After the pressing is complete, the sandwich is dried at 212°F. in a weighing bottle and weighed. The platen assembly used allows the simultaneous pressing of three samples.

As a result of the modification of the press method this method will now give fairly concordant results in the hands of different operators. It is still true the results obtained by the press method bear no direct relation to the actual oil content of the wax and this is recognized by the American Society for Testing Materials in the title of the tentative method which reads "Tentative Method of Test for Expressible Oil Moisture in Paraffin Wax." This method is recommended only for waxes having melting points of 108° or higher.

Although the press method does not give true evaluations of the oil content of the wax, it does give important and valuable information as to the degree of refinement of the wax. Inasmuch as the trade has become accustomed through long usage to evaluated waxes upon the basis of expressible oil and moisture, the improved press method can be used without causing any confusion in the industry such as might result were a method adopted which showed the true oil content of the wax. As a matter of fact, refined waxes having melting points of 118°F. or higher, are, to all intents and purposes, oil-free and the melting point and other characteristics of the wax claim the attention of the uses.

As the situation now stands, there is not as yet available a method by which the actual oil content of paraffin wax can be determined with ease, accuracy and certainty. However, any one of the methods which have been described may be used with satisfaction under certain circumstances, provided due consideration is given to the capabilities and shortcomings of the particular methods.

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Ibid., Vol. 28, Part 1, P. 446 (1928.)
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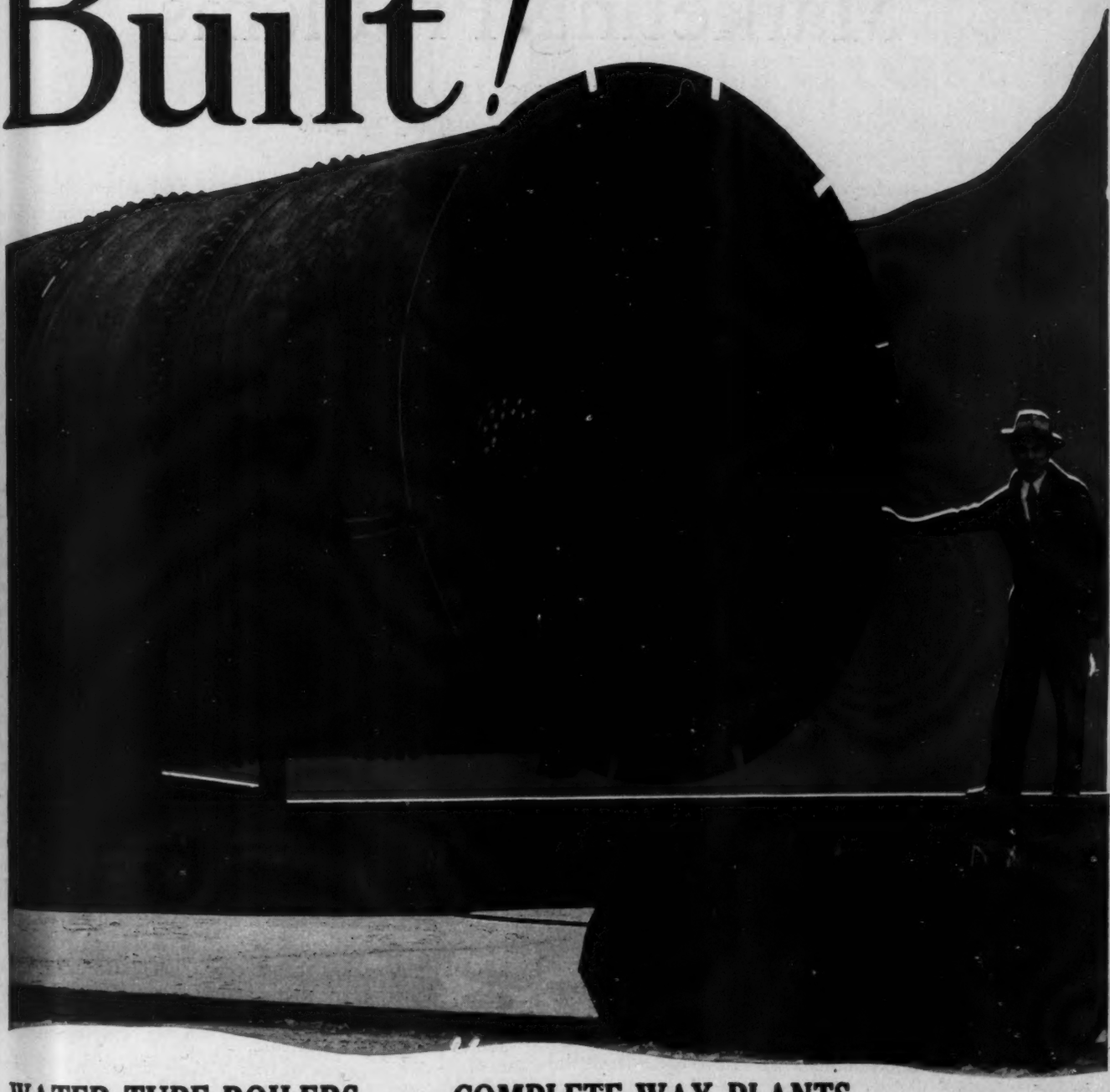

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PROCEEDINGS OF THE NATIONAL PETROLEUM ASSOCIATION

Marketing Problems

By W. T. HOLLIDAY
President, Standard Oil Company of Ohio

EACH has marketing problems of his own that take almost all his time and attention. Many of them we would not feel free to discuss in public. Our own peculiar problems, however, are complicated by general conditions which constitute common marketing problems of the industry. Some aspects of these common problems I would consider.

It would be folly for anyone to attempt to offer practicable solutions of the basic problems of our industry. Some time ago I received a letter from a jobber advising that he had invented a price structure which would solve all of the marketing difficulties and enable all of the oil marketing companies to make more money, stating that he would be willing to divulge his plan to our company provided he had a contract from us in advance agreeing to pay him certain royalty upon all of our company's sales. Of course no one knows better than you gentlemen that there is no panacea for our present difficulties, and you probably each have had the experience, no matter what particular marketing policy you adopted, of wishing you had tried something else. I suggest that ultimately our problems will have to be solved by economic evolution and that about the most any of us can do is try to determine what the economic tendencies are and attempt to steer our respective courses with the economic tide.

DEMAND FOR AUTOMOBILES BASIC—GASOLINE SECONDARY

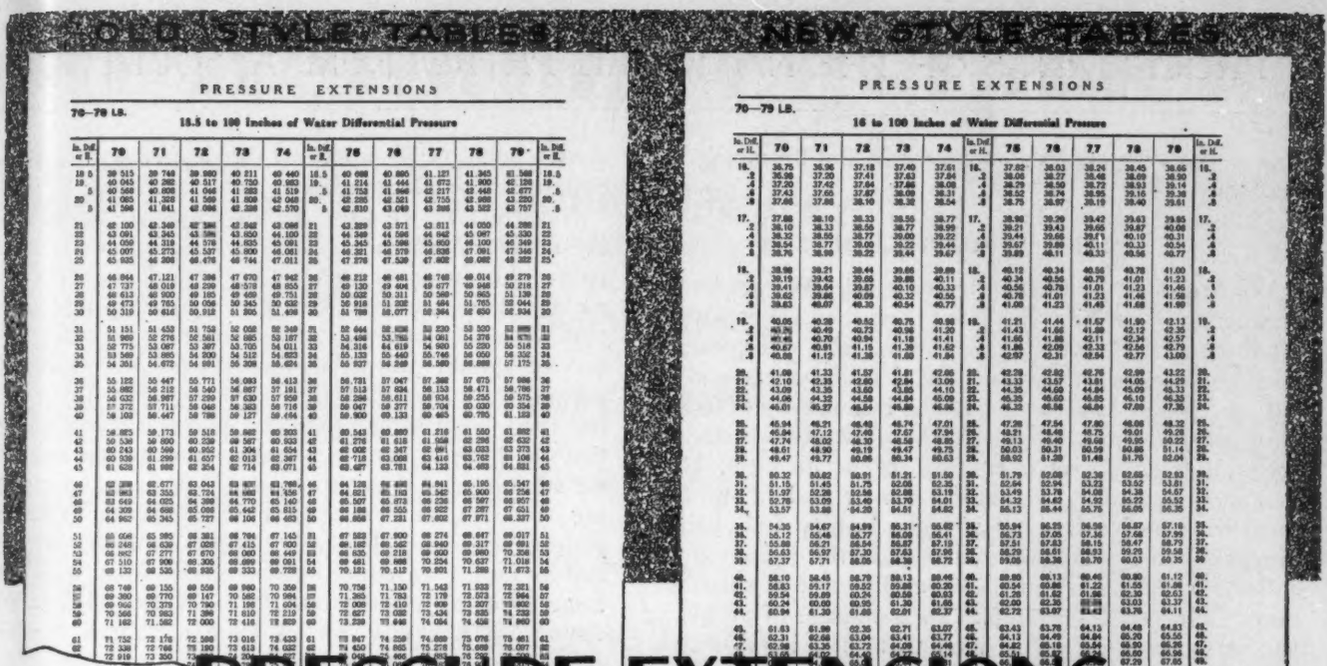
Gasoline prices for a long time have been the lowest of all basic commodities. On top of this situation we have had for a long time a fluctuation of prices and a variation of prices among competitors, resulting from widespread price cutting, open and secret, which indicates a fundamentally unbalanced economic condition.

Almost all of the economists who have considered the industry have failed to take into account the results of the fact that the oil industry is one whose law of supply and demand involves what is called a derived or secondary demand. The demand for its principal product is secondary to the demand for the products of an entirely different industry. It has been the advertising, price reduction and resultant increased production of the automobile industry which has created the demand for gasoline. Advertising and price cutting of gasoline do not materially increase the demand for that product. They simply take the business from one competitor and give it to another. In such an industry of secondary demand, therefore, there is in times of economic equilibrium, a follow-the-leader price tendency. Competitors' prices under normal conditions go up and down with those of the largest competitor and when there is no oversupply prices tend to be fairly uniform in a given territory. We all can remember when that condition existed in our industry and we also can remember that the industry came in for criticism because of that situation. We were being criticized for a condition that was economically normal at that time to an industry whose demand is a secondary demand. The steel industry, for example, has behaved in much the same way because it, too, sells a basic product, the demand for which is created by other industries. The very fact, therefore, that today we have so much advertising and price variation as to gasoline, indicates that our industry is far from economic equilibrium. Price cutting in our industry has a peculiar significance. Since it cannot stimulate the total demand, it tends toward industrial self-destruction. It indicates that the industry is performing a surgical operation upon itself in an unconscious effort to restore itself to economic health.

SURPLUS DISTRIBUTION FACILITIES

Price cutting in our industry represents the pressure of an over-supply of products. The public's interest has been injured by reason of the fact that price cutting has represented the invasion of more distribution equipment than was needed, with a consequently rising cost of distribution. Ultimately such unnecessary duplication of distribution facilities must throw back upon the public the cost of such uneconomic distribution. The ordinary man on the street appreciates the waste involved in unnecessary duplication of service stations and pumps, but he does not realize that the original cause of this was over-production of goods and that the means by which the over-expansion of distribution facilities was achieved was price cutting.

How did we come to this present situation? Will we not have to admit that our industry has been a sort of Klondike boom? Our industry might more properly be called the gasoline business, and it really had its beginning only about 17 years ago. A new and rapidly expanding industry like ours usually has three stages of development. The first stage is characterized by rapid expansion and wide margins of profit which are needed to make possible such rapid expansion. In the second stage there is an inrush of outside capital attracted by those wide profits, until the business becomes overcrowded and there is over-production and demoralization of prices. Then comes the third stage, a period of sifting, survival, merger and getting down to a brass tack efficiency, a hard-pan proposition with the boom all gone. Has not our industry passed through those



PRESSURE EXTENSIONS *in more simple form.* Much easier to use

A CONSIDERABLE number of users of orifice meters are still using the First Edition of Pressure Extensions, compiled by the late Henry P. Westcott and originally published in 1920. There are now two Metric publications of Pressure Extensions which represent improvements of sufficient importance to make their use desirable everywhere *orifice* meter records are being handled.

The information given in the modern book of Pressure Extensions parallels that in the obsolete edition. The range of both sets of tables covers pressures from 29 Inches Mercury Vapor to 500 pounds. However, the 2″ longer page of the new book permits a much better arrangement of columns and figures. The increased page depth also permits a repetition of column headings midway down the page which saves eye-travel. It also permits greater horizontal spacing between every five lines.

The chief advantages of the newer arrangement of Pressure Extensions is that they permit more rapid work. This is accomplished mainly by changing the physical characteristics of the pages so that the eye can find the desired reading much more quickly and with less effort.

To secure this improvement, a soft yellow paper is used. Quite bold and legible type, with proper differentiation in boldness between the index and extension columns completes an arrangement that attains maximum readability with a minimum of strain on the user's eyes.

Since this book covers much more data than is ordinarily required for general use, the first 21 pages are bound in lighter and cheaper form. The range covered in this abbreviated book goes to 49 pounds. Where this range is sufficiently high, the abbreviated edition is recommended because of the easier handling of fewer pages and the saving in cost. The paper used is a tough, heavy stock, selected for its wearing qualities. Explanation of the use of the tables appears in both books.

We are glad to submit both books on approval for comparison and without obligation to buy them. One or the other will certainly be found a great improvement over the 1920 edition of Pressure Extensions. The price of the complete book (87 pages, cloth binding) is $12.50; of the abbreviated book (21 pages stiff paper binding) $2.50, parcel post prepaid.

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first two stages and is it not now in the beginning of that third stage?

ENTRY OF NEW BLOOD

We had over-production of crude oil. We got over-production of refining capacity. And then we got over-production of distribution facilities. The overproduction of refineries called for marketing outlets and it put new people into the marketing business by offering tank car gasoline at prices so far below service station prices as to supply an irresistible magnet to them. This was accompanied by the putting of new dealers into the retail business by the orgy of pump burning and similar practices. The result, of course, was the reduction of gallonage per pump and the mounting cost of distribution. Contrast, for example, the gallonage of an average service station today with that of a horse-drawn tank wagon of 20 years ago.

At the time the governor of South Dakota entered the gasoline business, some of the larger oil companies came in for criticism at the hands of the Federal Trade Commission and others because they did not reduce their retail prices to a closer margin above current tank car prices. As we look back upon it now, we might say that our present demoralization might have been prevented if those companies had fought the issues at that time by reducing their retail prices to a point where the margin between the tank car and service station prices would not have attracted newcomers into the marketing business. The answer is that economic laws operate because human beings always behave like human beings. Economics was the original behavioristic psychologist! The industry was still in the first stage of development: the oil companies already in business could sell at the prices they asked because their distribution facilities were still needed to supply the demand and they could not sell at a loss or at a narrow margin of profit and make enough to expand their facilities in proportion to the increase in demand. The larger oil companies were not buying distress gasoline; they were making their own at costs which would not permit them to narrow margins without loss or at least without diminution of profit beyond what their expansion requirements demanded. Our industry, as I said before, went through the first two economic stages of a rapidly expanding industry. It is idle to criticize it for having behaved in accordance with economic law. A very part of economic law is that men do not have foresight as clear as hindsight.

WHAT CAN WE LEARN TODAY BY HINDSIGHT?

If the immediate cause of over-crowding in the marketing end of the business was excessive margins, then clearly the lesson of the past is that margins must become sufficiently low to prevent attracting new-comers and to force the uneconomic units out of the business. We know that when the margin between tank car and service station prices gets beyond a certain point, price cutting in the tank wagon and service station price occurs. And we know that when the margin between tank wagon and service station prices gets beyond a certain point, price cutting by the dealers occurs. Sooner or later those margins have got to narrow.

Nevertheless, we see today competition forcing down the tank car price and marketing companies failing to reduce their tank wagon and service station prices. And we see these same marketing companies competing on tank wagon prices without considering its effect upon service station prices. Oil companies are continually permitting competition to change not only their prices but their price structure. For example let us suppose that the general margin between tank wagon and service station price was three cents. Someone starts selling at a one cent lower tank wagon price. The competitors are compelled to meet that tank wagon price, and by failing to reduce their service station price at the same time, permit the margin to be extended to four cents. In this way we all have witnessed the price structure itself changed from a two or a three cent margin to a five or six cent margin. The result is the continued increase of new dealers attracted by the wide margins. As the margins widen, price cutting of the service station price inevitably follows.

BENEFIT OF UNIFORM NARROW MARGINS

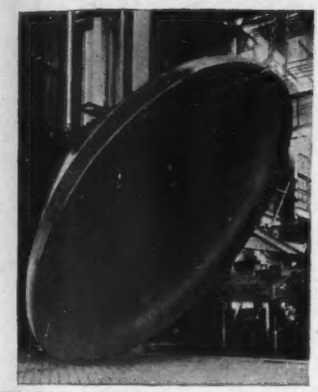
Eventually in this process neither the public nor the dealer is benefited, but rather is damaged. The increased number of pumps reduces the gallonage per pump, increases the cost of distribution and reduces the dealer's profit to the point where he needs a wider and wider margin.

If we are to learn the lesson of the past, have we not eventually got to realize that there is some price structure, that is, relativity of tank car, tank wagon and service station prices, which is sound for a given territory and which must not be permitted to be changed by competition on one particular price in the structure? If a price structure is sound, then it is worth fighting for, and if one particular price in the structure has to be declined, the entire structure should be correspondingly declined. Until this is done we will continue to have in the marketing end of the business itself (as there has been in the industry as a whole), a shifting division of the entire margin which will continue to attract newcomers into the particular division enjoying the wider margin and postpone the day of elimination of over-supply of distribution facilities.

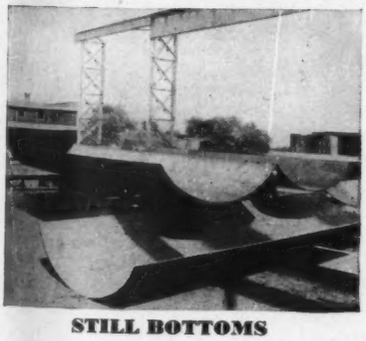
Coupon book discounts, commercial discounts, secret rebates and all other forms of price cutting, open or secret, have been the inevitable by-product of the margins which made them possible. The Marketing Code now being adopted by the industry aims to strike out the element of secrecy in price cuts and to force prices out into the open, unobscured by secret concessions or immeasurable bribes like building and painting. No one, however, expects the code to change economic causes. So long as margins permit, there will be price cutting, and in spite of the code the price cutting on the part of many of the dealers, at least, will be secret. Indeed, the code itself, inconsistent with its whole purpose and tenor, permits secret price cutting in its provision as to

Oil Refining Equipment

IMPREGNATOR SHELL



SPECIAL CONE (15 ft. diameter)



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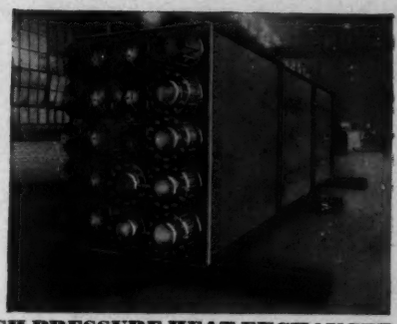
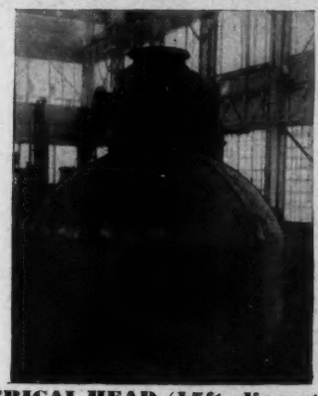
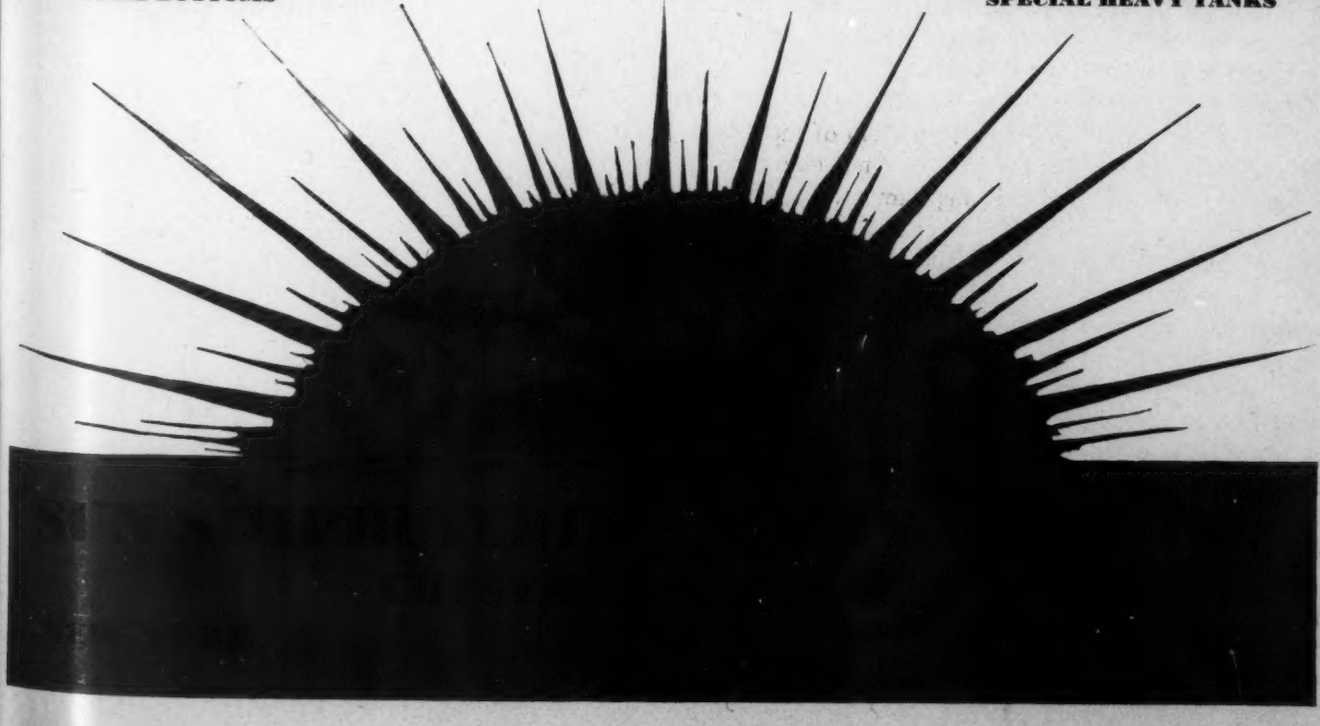


HIGH PRESSURE HEAT EXCHANGED



SPHERICAL HEAD (15ft. diameter)

SPECIAL HEAVY TANKS



PROCEEDINGS OF THE NATIONAL PETROLEUM ASSOCIATION

commercial discounts in states where such discounts have been in vogue.

The public interest, as well as the interest of the gasoline business, requires the narrowing and maintenance of margins to a point where undue economic waste will cease. Have we not eventually got to reverse the process which brought us to our present state by getting back to a margin of profit from the well to the consumer and a division of that profit among the vertical divisions of the business, neither of which will permit over-production in any branch of the industry? Codes of ethics, trade associations and similar movements can be helpful in the way of education and perhaps of acceleration of economic trend, but in the last analysis our problems will have to be solved, as they were created, by economic evolution.

Fire Prevention and Safety

By JAMES J. HERBERT
Standard Oil Company of Ohio

IN planning the very meagre talk which I am to give today, I could not help but think that those of you who have attended the National Petroleum Association meetings regularly during the past two and one-half years justifiably have many morbid thoughts pass through your minds every time you see my name appear on the program. My talk always deals with the same subject and it is usually divided into three principal parts. In the first place I generally describe in more or less detail, the causes of fires which one or many of you have experienced. This is not always a very pleasant subject —to bring back the story of a fire which may have completely or partially destroyed the refinery represented by one or more of you gentlemen present. It is perhaps more or less interesting to other refinery representatives, but probably quite morbid for the affected ones.

In the second place, I usually paint a picture of disaster for those who do not practice fire prevention and fire fighting as well as accident prevention and first aid. In this sense I feel more or less like the man who takes great delight in telling little children to be very careful and behave well, less the proverbial "Boogey Man" gets them.

Lastly, I usually devote a small portion of my alloted time in mildly censuring everyone for not co-operating completely enough with this department. It is quite true that there is no compulsion called for in adhering to this work, as it is merely something of which each member may or may not partake—according to his wishes. Nevertheless, I feel that this department can be of such value to every member, if every member does his part, that members who do not co-operate are deserving of at least a light censure.

All in all, my talks usually refer to disaster and are of a haggling nature.

Now today I am going to follow the same procedure. I have one story and I am going to stick to it.

I am not going into detail about many fires which the association members have experienced, because in the past year there has only been one of any serious consequences—to my knowledge—and that is the fire which took place on the property of the Continental Refining Company in July.

LESSONS LEARNED FROM FIRE

At this time, mention should be made of the fine spirit which the Continental Refining Company showed in sending to this department for distribution to all the members such a detailed and helpful report. If there are any members present who have not read this report, I refer them to the bulletin of the department of Welfare and Insurance of September 7. The Continental not only described the fire, but listed the lessons which they learned as a result of it:

1. They gave proof of the need of a large supply of water which prevented their burning gasoline and cylinder stock mixture from spreading over the ground before cooling, to adjacent buildings and tanks.
2. They suggest that ammonia coils be protected from fire hazards less the heat burst them and prevent the firemen from entering the zone on account of ammonia vapors.
3. Alleys which might carry gasoline vapors from a filter house to a bone burning house, should be guarded against.
4. Power for water pumps should be obtained from more than one source—electric power as well as steam.
5. Construction of a filter house should be of such nature that if a filter overflows or there is a spill, the liquid cannot reach the lower floor; this can be overcome by a proper drainage system.
6. Stairways should lead to a filter house from the exterior, thus preventing the possibility of burning liquid from flowing down the stairs.
7. Filters should be placed on steel supports, independent of the building walls, so that in case a wall or two is blown out, the filters will remain standing.
8. Large windows or curtains may be placed in the walls of a filter house so that if there is an explosion, the gasses may leave by these outlets in place of exerting a pressure on the building walls and perhaps blowing them or the roof away.
9. When a refinery is located near a body of water,

Fig. 65, side view

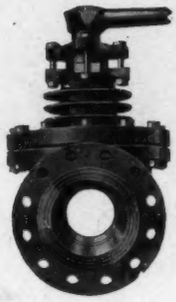


Fig. 65, end view

Fig. 62

They Solve the valve problem on vacuum stills

Elimination tests, during six months, by two marketers of vacuum processes, established the superiority of Homestead Cast Steel Refinery Valves for vacuum service.

Result? The largest Refiner in America ordered them for two new installations.

A practically perfect vacuum is held by the deep stuffing box of the Homestead Refinery Valve, Figure 65. Rapid drying of the packing is prevented by cap fins that quickly radiate the heat at 550 to 700° Fahrenheit temperatures of vacuum service.

The refinery cap may also be put on three way valves used on hot oil exchangers. On cracking stills the round port is of advantage for carbon can be cleaned from valve and line at the same time.

For severe service in refineries, the Homestead Refinery Valve is unequalled, for it also incorporates the famous Homestead Quarter-Turn construction principles.

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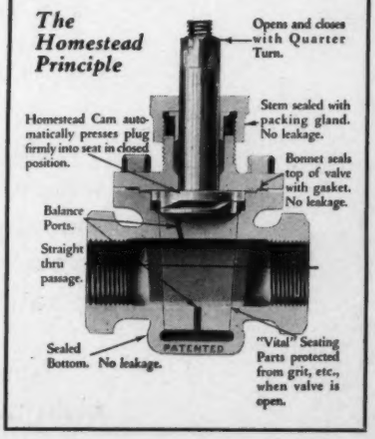
Wax presses
Loading racks
Gas lift installations
Vacuum service

The two Homestead Valves illustrated are all cast steel valves. Figure 62 is a reliable valve for Still service of any kind not exceeding 350 lbs. working pressure, 750° temperature. This valve will handle most refinery high pressure-temperature requirements. Figure 65 is practically the same type valve, tho heavier and with cooling fins added to protect the packing. It is more suitable for use on cracking units and it has a special plug taper which was designed for refinery service. It may be secured with worm and gear control. Lubricating systems can be provided for corrosive service conditions.

Our new reference book of Homestead Valves is ready to be mailed upon request

The Homestead Principle


Opens and closes with Quarter Turn.
Stem sealed with packing gland. No leakage.
Homestead Cam automatically presses plug firmly into seat in closed position.
Bonnet seals top of valve with gasket. No leakage.
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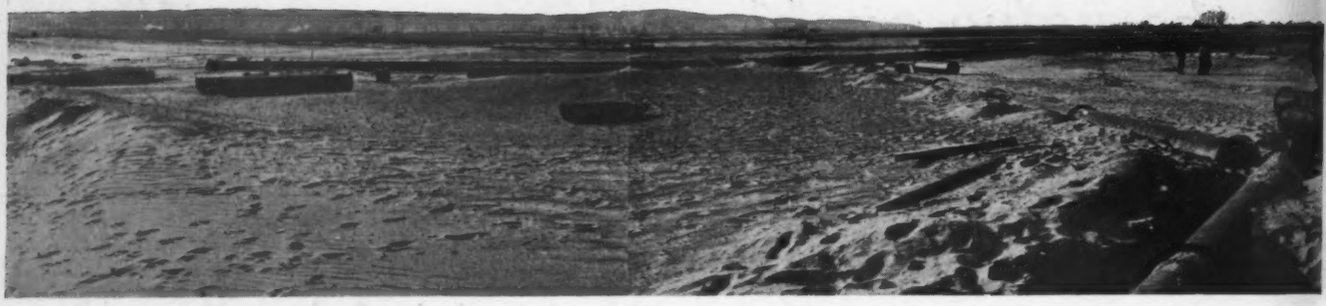
From a Field of Sand to a Complete Refinery -in 8 Months



A McKee Record

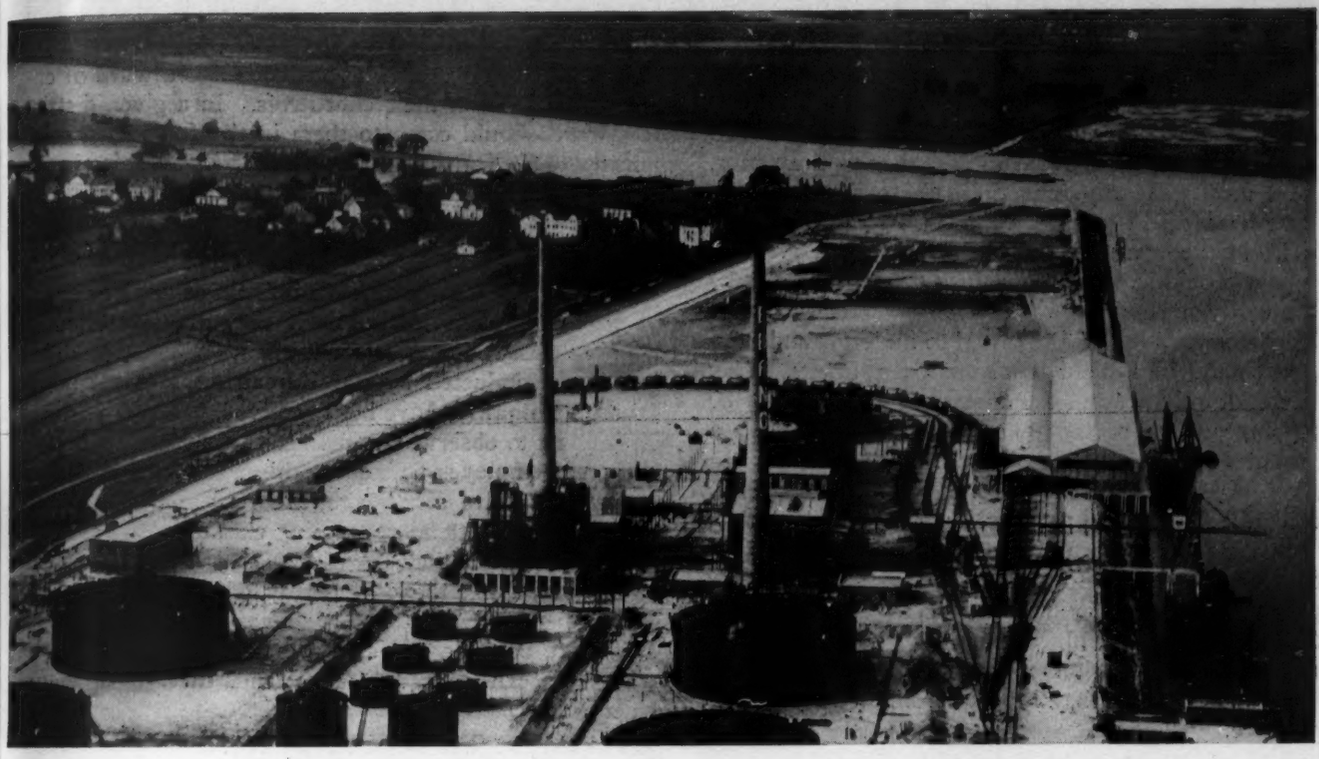
THE illustration at the left shows the Site and the airplane view at the right shows the completed Refinery erected at Hamburg, Germany.

On November 1st, 1928, when the erection force took possession, the site was a barren piece of ground, consisting largely of sand dredged from the river. On July 1st, 1929, a complete 6,000 barrel refinery had been erected on this site and was ready for operation.

Not only was this work completed within the short space of eight months, but it was accomplished in spite of the most severe winter in the history of Continental Europe. During three of these months practically no construction work could be carried on.

In addition to the erection and equipment of the refinery itself, the work included warehouses, docks and equipment for handling crude and finished products; coal unloading docks, storage and handling equipment; complete systems for water, fire protection,

McKEE SERVICE IS WORLD-WIDE



d in Hamburg Germany

air lines, electric power and lighting; office, administration and laboratory buildings, etc.

This complete program is typical of McKee world wide service, including not only the designing, furnishing of materials and completed erection; but also the endless governmental and labor details necessary to the performance of construction work in a foreign land.

To the Refining Division of the Petroleum Industry we offer our services in the establishing and completion of a satisfactory program—whether the work be the revision and expansion of present equipment or the building of a complete refinery.

ARTHUR G. McKEE & CO.

ENGINEERS & CONTRACTORS

2422 EUCLID AVE CLEVELAND, O., U.S.A.

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pipes should be run to it with land connections for connecting to a fire department pumper. This will save time, as otherwise the firemen will have to run a cumbersome hose from the pumper to the water, and most generally it is difficult to place a large fire department pumper very close to a creek or a lake in the immediate vicinity of a refinery. The plugs should be painted bright red so that they may be easily noticed.

10. Suitable yard drains connected to underground sewers should be located throughout a refinery. This will not only prevent the spread of fire, but also be the means of saving oil if the sewers lead to a properly constructed catch tank.

We find listed by the Continental Refining Company, 10 splendid reasons and practical suggestions which they pass on to every member of the National Petroleum Association in the spirit that these suggestions may help to prevent a similar fire in the refineries represented by each one of us present. Experience only can show many of these precautions and they have gladly passed on the lessons which they learned from an unfortunate experience.

PREPARATIONS OF REPORTS URGED

These suggestions, of course, appear in the bulletin to which I referred you, but I wished to bring them out again to show the value of such information to this department; to show that this department is really a clearing house for information of this type, and to urge you to send similar information to us of your own free accord without being urged at the time.

At this time I do not wish to insinuate that the Continental Refining Company has been the only member to comply with our wishes, because several other members have very graciously. But we do believe that many more reports of fires could be made. Again, we urge everyone to report a small fire as well as a large one, because they are just as important.

The fire and safety marshals' groups which are located in the various districts have not progressed as well this year as they have in the past. They went ahead quite well for a while, and then their spirit began to drop again. The mashals have been organized; they have the necessary basic interest in the movement; as individuals they favor it because they see its value, but they can only go so far. Beyond this point they cannot go, unless their executives show constructive interest in their work. The groups are merely dormant, and all that is necessary to have them proceed is a word of encouragement from their executives. In a given district this word should come to them in the form of a compulsory order for them to meet regularly and also in the form of regular acknowledgment of their work.

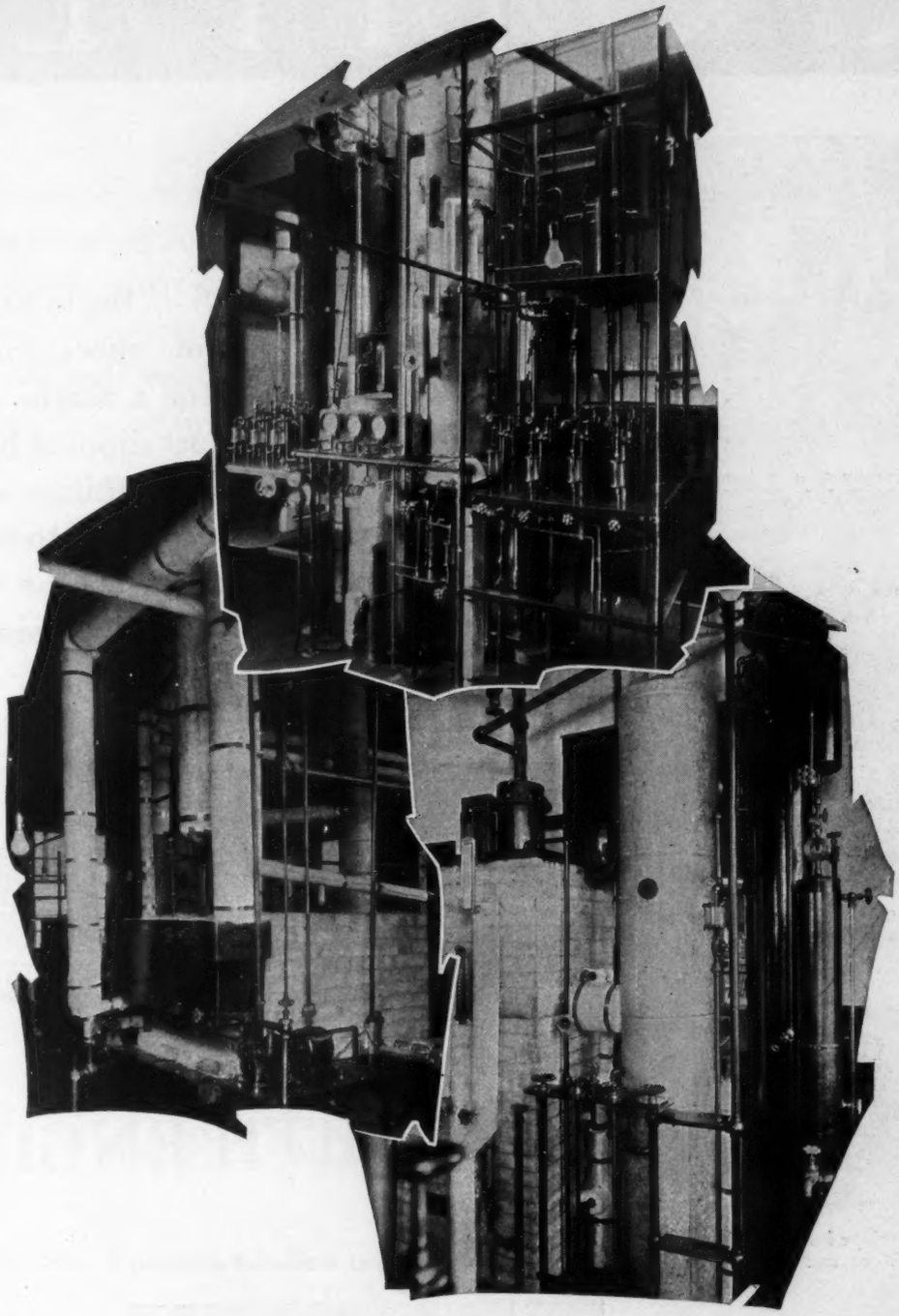
INTEREST IN SAFETY IS INDIVIDUAL

In reply to the department's bulletin asking for members to state their intentions if they are interested in training classes for their employes in first aid to the injured, as conducted by the Bureau of Mines, several favorable inquiries have been received. It is of particular interest to observe that refineries which have already had their employes trained in this work by the bureau about a year and a half ago, are very anxious to have their employes attend re-training classes. It is also interesting to hear that the employes themselves are desirous of having the opportunity of attending the re-training classes. This, itself, shows that the men themselves are becoming safety-wise and are anxious to do what they can to assist their friends in case of an accident.

Training in first aid to the injured, as ably conducted by the Bureau of Mines, shows a three-fold result. In the first place, it shows men the proper manner of caring for their fellow employes if injured; secondly, it teaches men the results of carelessness; they cannot help but see this when they spend 15 hours of required training in placing bandages on make-believe wounds, and in the third place, it brings the men in a refinery together in a constructive manner. When working together in training classes, they appreciate more readily that they belong to an important unit in their refinery and that their co-operation in every detail is essential. They also are able to meet or know men in other departments in the refinery where they are employed.

Inquiries regarding this training, which has been offered so kindly by the Bureau of Mines, have come in from every district. Not all the refineries in each district have said, however, they are interested in assisting the Bureau of Mines in planning a schedule. We would like to hear from the others, pro or con, as soon as possible, because the training classes will start some time during October. It is just as convenient for the Bureau of Mines representatives to train the employes of all the refineries in a given district as it is to train those in one refinery. So please let us hear from you at your earliest convenience.

A 20 bbl. Lummus Refinery!



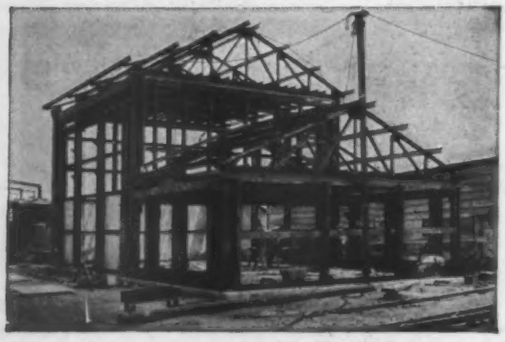
Complete with pipe stills, atmospheric and vacuum towers enables us to process your crude as a preliminary to our design of a plant to meet your needs.

Lummus Petroleum Refineries

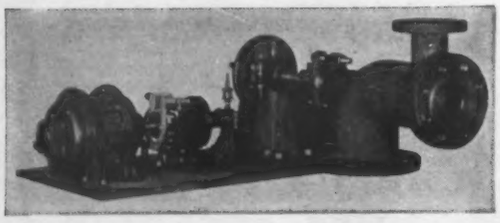
The Walter E. Lummus Co.
145 Milk St., Boston, Mass.

COMPLE

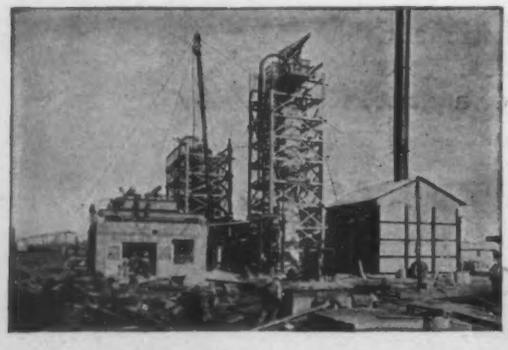
Accurate laboratory investigation is fundamental to successful design.



Typical of careful engineering, ample strength and practical design.



Special equipment developed and designed for extreme conditions and service.



Erection crews under experienced supervision assure construction in accord with specifications.

COMPLETENESS — the indispensable foundation of successful work, whether it be for a single unit or a complete plant. Not just slipping by specifications, but adding those things which vision and foresightedness show to make it a bigger and better job, giving the best that years of experience and ability are capable of giving.

LABORATORY INVESTIGATION
ENGINEERING DESIGN AND CO-ORDINATION
CONSTRUCTION
OPERATION
BY SMITH REFINERY SPECIALISTS

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Centralized control insures economical operation.

District Offices
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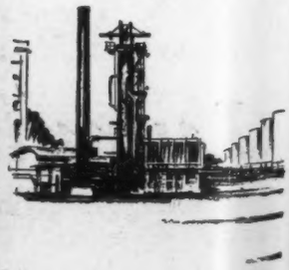
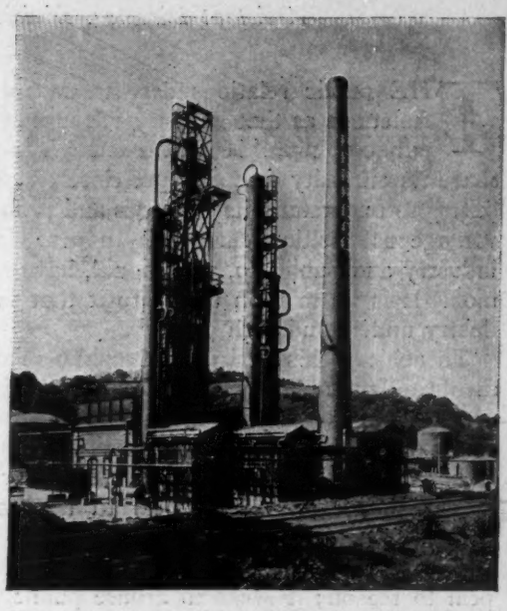


TENESS

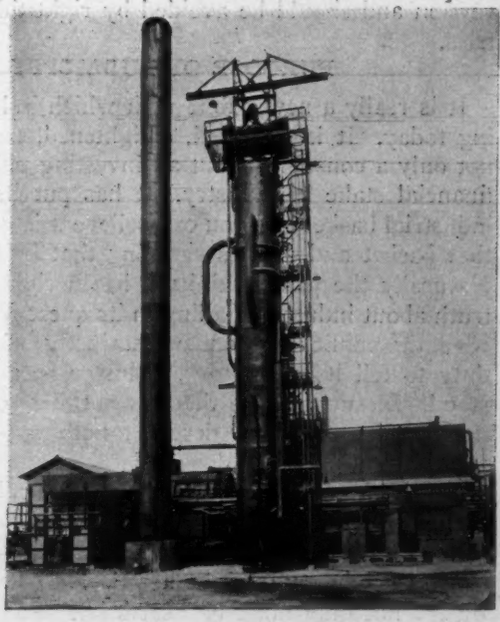
Completeness—is always outstanding in all Smith Engineering jobs. Completeness—because they are surrounded with a complete staff of trained specialists with which to solve the most difficult refinery problem and see it through to a precise finish.

Every detail is carefully supervised by men who have made refinery problems a life study. Couple this experience with the determination of these men to give the best they have on every job and you will readily see why completeness has been an outstanding accomplishment in all of their profit producing refinery units and plants.

The far reaching resources of this company have placed the trained services of this group of men at your disposal. Let us work out your next refinery problem.



Topping, rerun and vacuum units designed and constructed for Pennsylvania Refining Company.



Centrifuge solution rerun unit for Texas Pacific Coal & Oil Company.

ING COMPANY

(PENN.)

107 W. Linwood, Kansas City, Mo.

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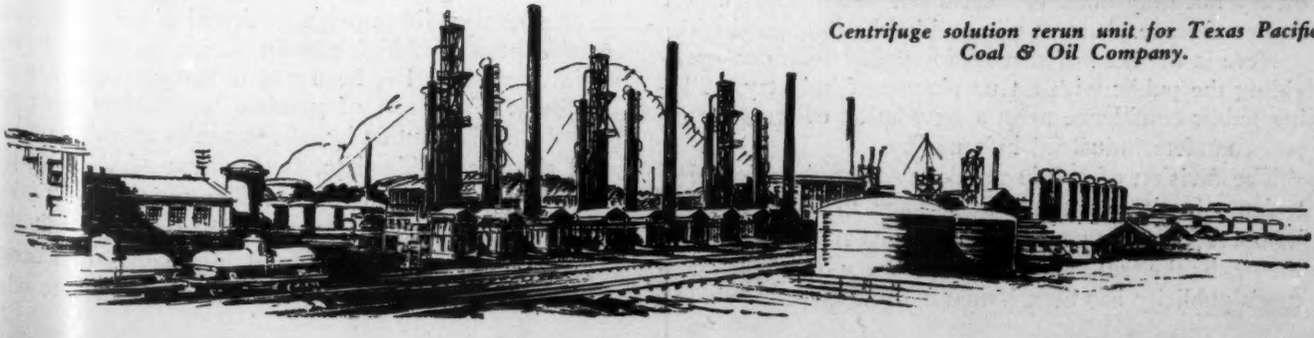

PROCEEDINGS OF THE NATIONAL PETROLEUM ASSOCIATION

The Oil Industry's Public Relations

By VICTOR H. SCALES

Assistant Director. Division of Public Relations, American Petroleum Institute

THE public relations department of an industry functions as that industry's friend at the court of public opinion. It is near enough to the public to share its curiosity complex, yet close enough to the industry to understand its purposes and problems. Its advantageous position enables it to recognize that both industry and public do, and should, have much in common. It is its mission to see to it that public and industry understand each other.

To achieve this desired end public relations departments today employ publicity, the dissemination of information through every available channel, the press, the magazines, the radio, the motion picture. Publicity is not to be confused with advertising or propaganda. Advertising carries an appeal to the pocketbook; it seeks to open the purse. Propaganda is an appeal to prejudice; it seeks to close the mind. Publicity is an appeal to reason; it seeks to arouse public thought. Primarily its purpose is to set forth the facts in the belief that the public, if rightly informed, will reach the right conclusion. Use of publicity in any other way is a perversion and should be avoided by right-thinking industries.

PURPOSE OF PUBLICITY

It is really a new public with which industry is dealing today. It is educated, enlightened, travelled. It is not only a consuming, but an investing public. It has a financial stake in industry. It has put its eggs in the industrial basket and you can believe it is going to watch that basket and who is carrying that basket and how. Naturally the public thinks it has a right to know the truth about industry. Failing in its quest for that knowledge, the public may condemn unjustly; neglectful of its duty to tell its own story, industry may be misunderstood. In such a case there is nothing so unwise as a deliberate attempt to deceive; nothing so sinister as silence.

But if the public has a right to know about industry, then industry has a right to be heard. Moreover, in order to succeed in this day of competition between industries, industry must be heard. And furthermore, industry not only must be heard, but heard with respect and confidence. It must win and hold public good will.

Here is the field of service for public relations—providing the public with a true picture of industry, building public confidence upon a foundation of trustworthy and complete industrial information.

The division of public relations of the American Petroleum Institute has had these ideas firmly in mind in its operations. Its general instructions are simple: "Tell the public the truth as we see it." Every bit of the Institute's publicity has been issued on that basis. The work has taken a definite shape this year and upon experience is based the idea of how the public relations department of the great American oil industry should function and what is really its field of service.

PEOPLE HAVE A RIGHT TO KNOW

The public is not unreceptive to oil information, as the newspaper columns clearly show. It is the concern and the duty of the Institute to issue to the press and the public, through every available channel, authentic facts and information concerning petroleum and to be on call at all times to supply such information. Perhaps one of the most important things done this year has been making available material giving the background of such projects as conservation, co-operation, the Code of Marketing Practices and information concerning all fundamental activities.

A good example of how the Institute's division of public relations functions is provided by the handling of publicity work in connection with a resolution against unreasonable state gasoline taxes adopted early this year by the board of directors. The announcement that the oil industry was opposing unreasonable taxes on behalf of the motorist reached not only the general public through the press and magazines, but the members of national and state motorist clubs and motor vehicle manufacturers and dealer associations through club and association publications, bulletins and bulletin boards. These organizations also were supplied directly with information and literature on gasoline taxes.

Since that resolution was passed, the American Automobile Association has announced it will oppose increases in gasoline taxes which are considered unreasonable. The American Motorists Association has developed a comprehensive plan of organization enlisting the support of motorist clubs and individual motorists everywhere in a campaign against excessive gasoline taxes. The National Automobile Dealers Association, the New York Automobile Merchants Association and the National Automobile Chamber of Commerce are supporting the movement. All these organizations are engaged in an educational campaign, designed to tell the motorist of the menace of high gasoline taxes, much of the material for which has been and is being supplied by the Institute. Four sets of gasoline tax folders were prepared for distribution by oil companies at filling stations and elsewhere. To date, two million of these folders have been ordered, the largest distribution of any folder ever prepared by the Institute. Thousands of editorials appearing in newspapers and magazines denouncing high gasoline taxes and diversion of revenue to other

VAPOR PHASE REFINING

Our licensees, in more than thirty refineries, are proving the validity of our claims to their own satisfaction and profit.

You too can decrease your treating losses and improve the quality of your cracked gasoline—at the same time reducing your costs.

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Vapor phase cracked products, as well as pressure distillates, are being successfully refined.

The Gray Processes Corporation

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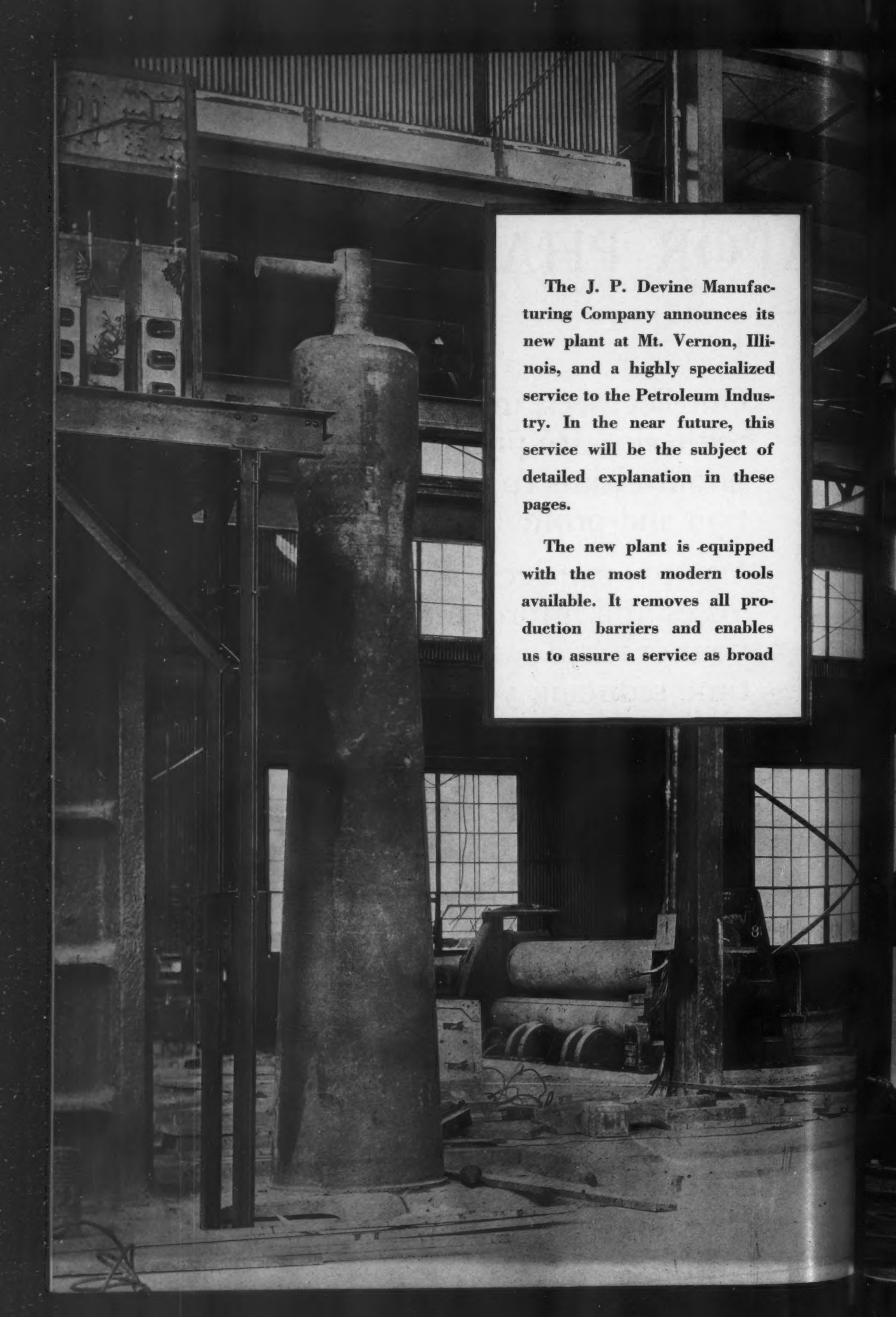
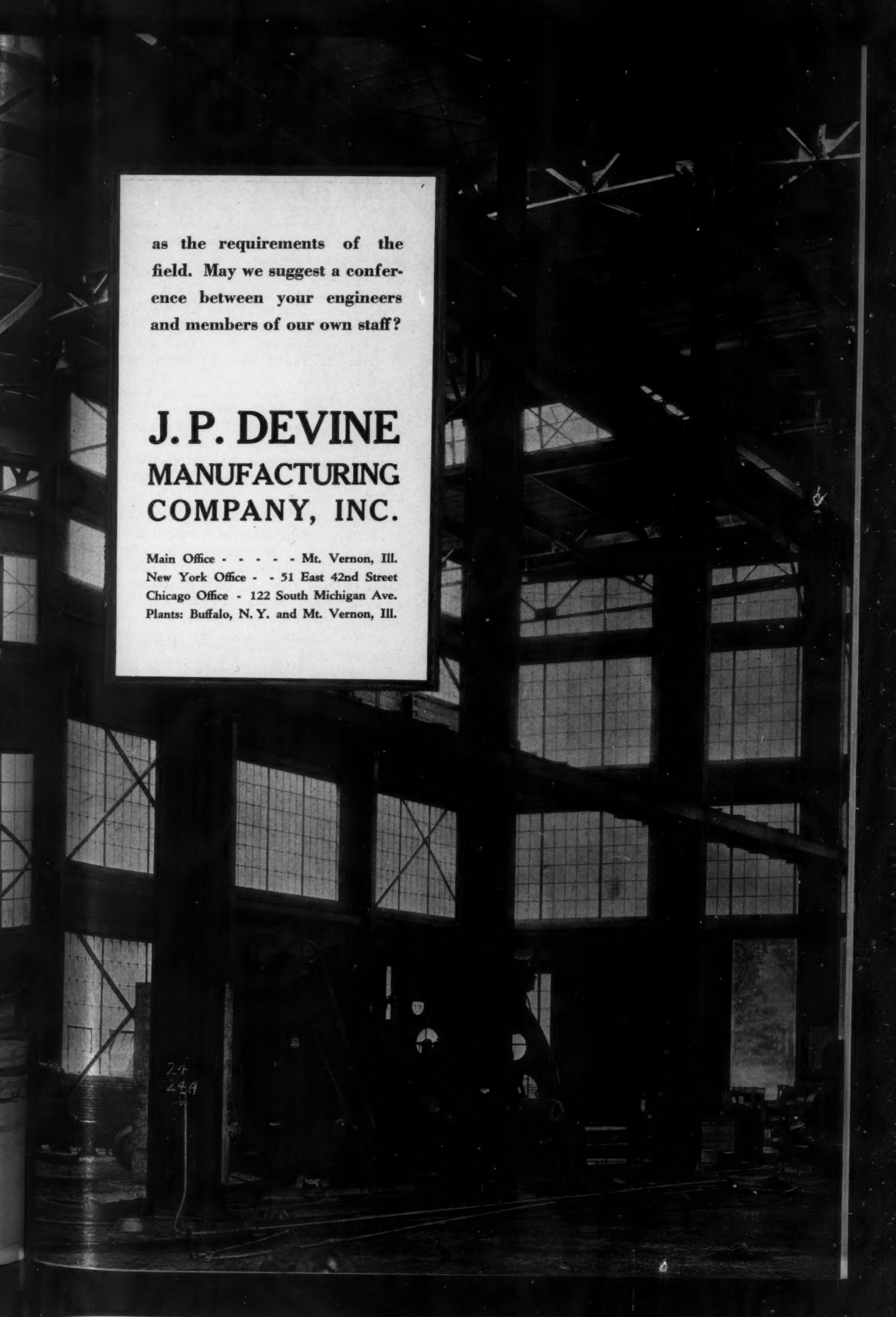


The J. P. Devine Manufacturing Company announces its new plant at Mt. Vernon, Illinois, and a highly specialized service to the Petroleum Industry. In the near future, this service will be the subject of detailed explanation in these pages.

The new plant is equipped with the most modern tools available. It removes all production barriers and enables us to assure a service as broad



as the requirements of the field. May we suggest a conference between your engineers and members of our own staff?

J. P. DEVINE MANUFACTURING COMPANY, INC.

Main Office - - - - - Mt. Vernon, Ill.
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than highway purposes are further proof that the Institute's work has borne good fruit. There can be no question that the motorist has been aroused to the danger of excessive gasoline taxation.

KNOW YOUR PUBLIC

But that is only one isolated instance. The Institute's publicity program is two-fold. It seeks not only to tell the public what the industry is doing, but to tell the industry what the public is thinking. For the information of the public, there is issued monthly a news clip sheet containing brief, interesting and true stories of the petroleum industry, its products and purposes, its problems and achievements, prepared for easy clipping by the editorial shears. It is sent to 8000 newspapers, press associations, magazines and trade journals in this and other countries.

As news developments, or industrial needs, arise, stories and pictures in matrix form are distributed to interested publications. Whenever possible, advance stories of meetings and projects are supplied to newspapers and trade journals to call the attention of editors to the nature and importance of the pending news development. If they are too busy to cover the story themselves, the division gladly does the work. Such advance material serves also correctly to outline the situation in the public mind.

Frequently special stories on pertinent subjects are prepared for submission to such publications as may be interested. More frequently such articles are prepared in answer to requests from editors. Effort is made to avoid flooding the market with petroleum publicity and to keep the industry and the Institute free of the cognomen "publicity hound." "Space grabbing" and the use of "influence" defeat their own purposes in the end. The editorial test: "Is it new, is it true, is it interesting" alone establishes the right of any article concerning any industry to fill news column space in the public press.

HELPING THE EDITORS

Especial effort is made to provide complete news coverage for the petroleum and associated trade journals. All Institute releases are sent to them. In addition, that they may at all times be in close touch with Institute activities, a Weekly Trade Press Release is mailed each Saturday to trade journals, the larger financial dailies, weeklies and magazines and the newspapers of the larger cities and of the oil field areas. This release contains notices of meetings, expected projects and pending developments, a review of the week's editorial comment on the industry, news of Institute divisional and departmental activity—in fact, every scrap of industrial and institutional news that can be collected.

Growing out of the Institute's friendly relations with editors is an information service maintained for their benefit. They are encouraged to come to the Institute whenever questions concerning the petroleum industry arise. This service has been extended to all institutions, industries and individuals interested in learning about the industry.

Direct-to-the-public publicity constantly is employed through pamphlets and handbooks prepared for distribution by oil companies and the Institute. "What Makes the Old Bus Go?" tells the story not only of gasoline, but of the whole industry, in a series of simple questions and answers. "The Oil Industry Today" similarly has been prepared for the information of stockholders. The fact that such booklets and pamphlets reach circulation of magazine proportions is indicative of their popularity, their punch and their potency for telling the public what it wants to know about the industry.

Even the book field has been penetrated, the Institute publishing annually the volume, "Petroleum Facts and Figures," year-book of the American oil man. This volume has been placed in the libraries of every large university and school in the United States, presented to influential editors and widely distributed within the industry.

GETTING THE PUBLIC'S REACTION

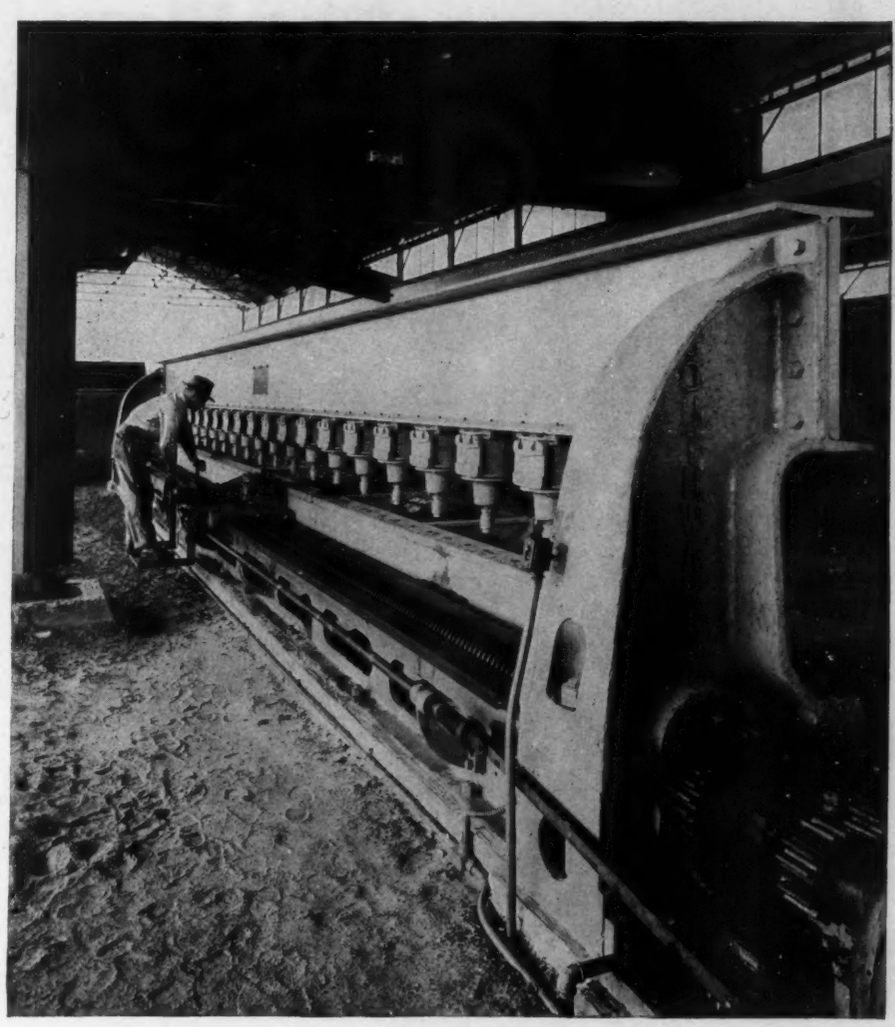
There is another phase of the work known as "diplomatic relations." Occasionally an editor or writer, usually through misinformation rather than animus, publishes an article putting the industry in an erroneous or unfair light. A special point is made to write that person, to give the facts in the case, to explain the situation carefully and to show him, if possible, where his reasoning errs.

So much for telling the public. The service rendered the industry is equally extensive. Thousands of news items and editorials are read and filed monthly. News items are referred to interested executives and departments. Each month the editorials are reprinted by photostatic process, bound in book form and placed in the hands of every director and executive of the Institute. A brief perusal provides quick grasp of public reaction to the petroleum industry's affairs and real contact information of the most illuminating and efficient type.

The 2,000,000 men and women in field, refinery and market, in filling station and office, the workers of the petroleum industry, are not forgotten. Monthly, through the medium of two bulletins, "Employer and Employe" and "The Dealer Public," they are told the history and traditions, the methods and purposes, the news and views of "their" industry. The material is widely used by the editors of house organs, by personnel directors, sales and advertising managers and others who believe that the employe who knows and understands his industry makes the better, more loyal worker. For this same purpose the Institute published the booklet, "Information and Your Job."

To oil men not familiar with this material, the Institute will gladly furnish copies, believing that a perusal will show any executive the advantage of sharing in its distribution. The division is glad to have suggestions as to how its material may be improved to meet the purposes of any unit of the industry. In the final analysis, material distributed to stockholders, employes, motorists and the public generally must coincide with the views and meet the requirements of the industry as a whole.

EQUIPMENT
back of good service at *Wyatt's*



36-FOOT PLATE PLANER

FOR maintaining a quality of work equal to that produced anywhere in the United States the Wyatt Metal & Boiler Works has placed in its Houston plant a number of machines destined to be of great value to the oil industry.

One of these machines is one of the largest plate planers in the country. It is 37 feet in length between housings and takes a 36-foot sheet up to 1½-inch plate. It reverses automatically.

In subsequent advertisements Wyatt's will describe other equipment of interest to the oil and gas industry. Watch for these advertisements and familiarize yourself with the equipment of the South's greatest fabricating shop. Plants at both Houston and Dallas. Let Wyatt's figure on your next job.

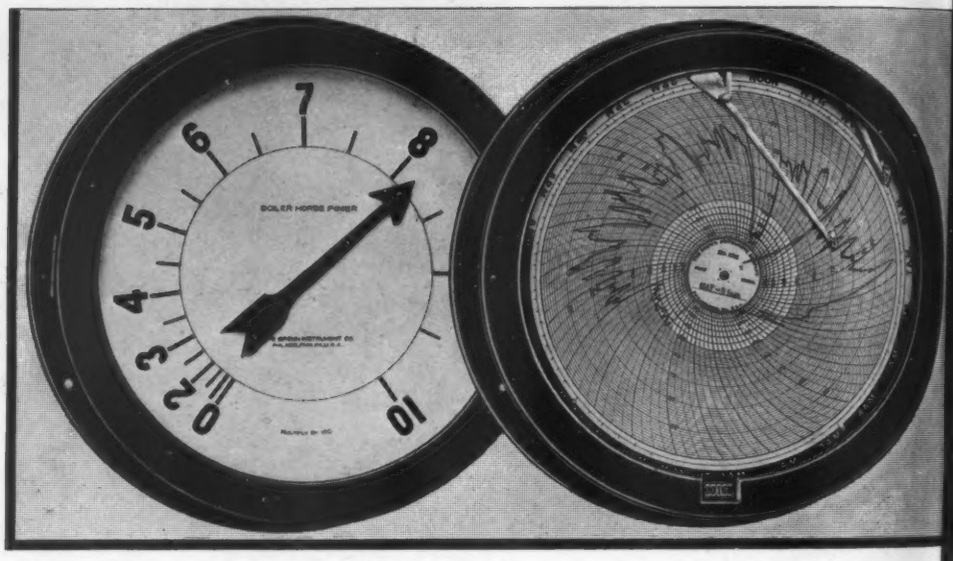
WYATT METAL & BOILER WORKS
DALLAS — *Capital $1,000.000* — HOUSTON

Wyatt's

WYATT
METAL & BOILER WORKS

For Every Requirement

The Flow Meter that "Has Everything"



The Flow Meter that "Has Everything"

1. Instruments operate at distance from manometer.
2. No bushings or rotating shafts through manometer case.
3. No wires pass through pressure chamber wall.
4. No voltage regulator or compensators needed.
5. Forged Steel Manometer for high pressures.
6. Blow-out check prevents surges from blowing out mercury.
7. Range can be easily, quickly and cheaply changed.
8. Automatic recording planimeter.
9. Instant-reading integrator dial.
10. Double-Range Manometer.
11. Electric circuit completely protected from moisture.
12. Electric system impervious to moisture.
13. Simple zero adjustment.
14. Built-in accuracy.
15. No transformers ordinarily required.
16. Current consumption practically negligi
17. No bother with clock-winding.
18. Motor-driven integrator.
19. Compact.
20. Small manometer mounts on floor or w
21. Large scale—easy reading.
22. Widest scale divisions where needed m
23. Outfit easily portable.
24. No delicate bearings.
25. Dustproof aluminum case.
26. Easy to install and maintain.

Write for Catalog No. 4498 W

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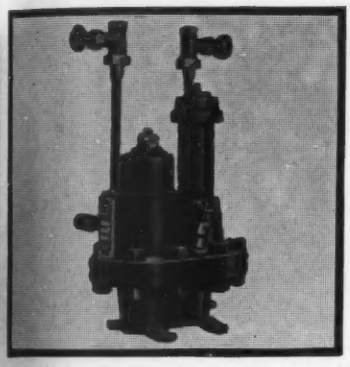
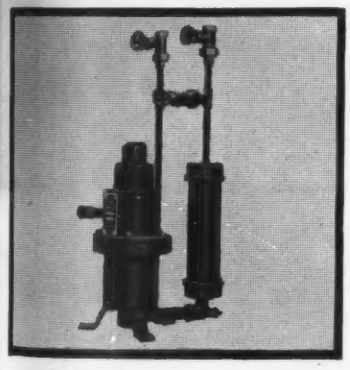
3 Types of Manometers



For High Pressure Differentials

Furnished for measuring the flow of any gas, vapor or liquid where a differential pressure across the orifice of 1.6 inches of mercury or over is permissible.
Standard models can be used for any pressure up to 750 pounds per square inch.

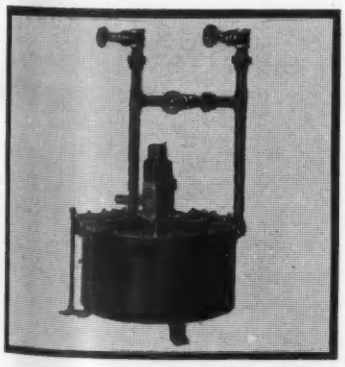
Special models can be supplied for pressures up to 1,500 lbs.



For Intermediate Pressure Differentials

Furnished for measuring the flow of gas or air where the orifice is designed for a moderate differential pressure and the pressure of the gas to be measured does not exceed 50 lbs. per square inch.

The lowest range gives full scale reading with a differential pressure of 2.17 inches of water, and the highest range gives a full scale reading with a differential pressure of 13.71 inches of water.



For Low Pressure Differentials

Furnished for measuring the flow of gas or air where the orifice is designed for a very small differential pressure, in order to keep the total pressure drop within reasonable limits, and the pressure of the gas to be measured does not exceed 10 lbs. per square inch.

The lowest range of this manometer gives a full scale reading with a differential pressure of .217 inches of water, and the highest range gives full scale on a differential pressure of 2.17 inches of water.

4498 Wayne Ave., Philadelphia, Pa.

"To measure is to economize"

Flow Meter

on the inductance bridge principle

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that is, of the companies, large and small, comprising the industry.

You are invited to watch for announcements of new publications. At the start of this year contemplated publications were announced, and many companies provided for the expense of distributing such material in advertising and other budgets. At the present time, there is being prepared a series of "Petroleum Primers," booklets which will deal with details of petroleum origin, history, production, refining, marketing and uses, in simple, non-technical language. They should serve to answer that request received daily by oil companies and the Institute: "Please tell me something about oil."

VALUE OF IT

The results of the publication of such material has been most satisfactory. It is reaching a large percentage of the 2,000,000-odd employes of the industry itself, the hundreds of thousands of dealers and their workers and the public. Whereas circulation now may be calculated in hundred-thousands, it will reach into the millions as the service attains its logical development.

Complete success of this service to the industry, as well as to the public, however, depends largely upon the character, quality and reliability of the publications made available. There is encouragement in the belief that it will not be long before all companies, large and small, will be looking to the Institute to supply educational material concerning the industry as a profitable supplement to the work they already are carrying on. The fact that the Institute can furnish a variety of such material that serves a valuable purpose in informing stockholders, employes and customers of the fundamentals of the industry, knowledge of which is necessary to mutual understanding, is realized by the industry. The best proof of this is that orders for publications have shown a great increase this year. Yet only the surface of real possibilities for service has been scratched.

But it must be said that the service rendered is to a degree measured by the extent of the active co-operation of the oil companies. The value of any department depends upon the practical assistance it renders the entire organization. Conversely, the amount of practical assistance it can render depends upon the support it receives from the entire organization.

Such support is merited. The results of public relations work are invaluable. The full worth of a common bond of understanding between industry and public, made possible and permanent by mutual respect welded from full, frank and trustworthy publicity, cannot be overestimated.

First Aid to the Injured in the Petroleum Industry

By J. J. FORBES

Supervising Engineer, Safety Division, U. S. Bureau of Mines

SINCE its inception in 1910, the United States Bureau of Mines has been engaged in the work of accident prevention in the mineral and petroleum industries. Among the activities carried on in this work is the educating of the worker to care for himself and his fellow-worker. Up to the present time nearly 400,000 persons in the mineral and petroleum industries have been trained in first aid and mine-rescue methods, and it is hoped that all workers engaged in these industries will ultimately receive this instruction.

The bureau's chief means of reaching the worker and interesting him in safety work is through its 22 safety stations; 11 of these are stationary buildings and 11 are movable cars. The stations are at Pittsburgh, Berkeley, California, Birmingham, Alabama, Evansville, Indiana, Jellico, Tennessee, McAlester, Oklahoma, Norton, Virginia, Salt Lake City, Vincennes, Indiana, Wilkes-Barre, Pennsylvania, and Seattle, Washington. The headquarters for the safety cars are Pittsburgh, Huntington, West Virginia, Pineville, Kentucky, Terre Haute, Indiana, Duluth, Minnesota, Des Moines, Iowa, Pittsburg, Kansas, Raton, New Mexico, Butte, Montana, Berkeley, and Anchorage, Alaska.

The personnel of the cars and stations devote their time to the instruction of workers in the mineral and petroleum industries in the principles of first aid to the injured and in mine-rescue methods. They conduct investigations of accidents, of explosions and fires, of the use of explosives, electrical equipment, and other safety devices and practices. They conduct field studies of different phases of the production of mining and petroleum, and they carry direct to the worker and the management the results of safety investigations conducted by the bureau and others. They give safety talks before groups of officials and workers, before institutes and at safety meetings.

WHAT THE COURSE EMBRACES

The complete course of first aid instruction given by the Bureau of Mines requires 15 hours of actual instruction and practice, which is usually given in five periods of three hours each. In brief, the course covers the treatment of the following: The circulation of the blood through the body, and the control of bleeding; physical shock; artificial respiration for persons overcome from gas, electric shock, and drowning; treatment and care of wounds to prevent infection; treatment and care of burns; dislocations; simple and com-

A SINGLE STANDARD of QUALITY in every SIZE and LENGTH

FROM the smallest tube to the heaviest pipe, one high standard of quality and workmanship is constantly maintained in the manufacture of Pittsburgh Seamless. A quarter century of experience in developing and producing seamless steel pipe and tubing *exclusively* has enabled us to achieve that high standard and to guarantee the unvarying *extra* margin of strength and safety in Pittsburgh Seamless that assures real economy in added years of service.

Pittsburgh Seamless is available in any range of carbon, or in special steels, in lengths up to 45 feet.

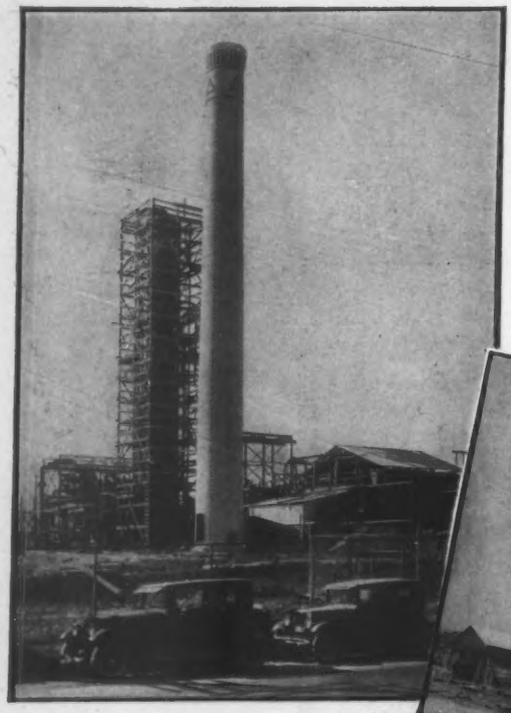
Pittsburgh Steel Products Co.

DIVISION OF
Pittsburgh Steel Co.

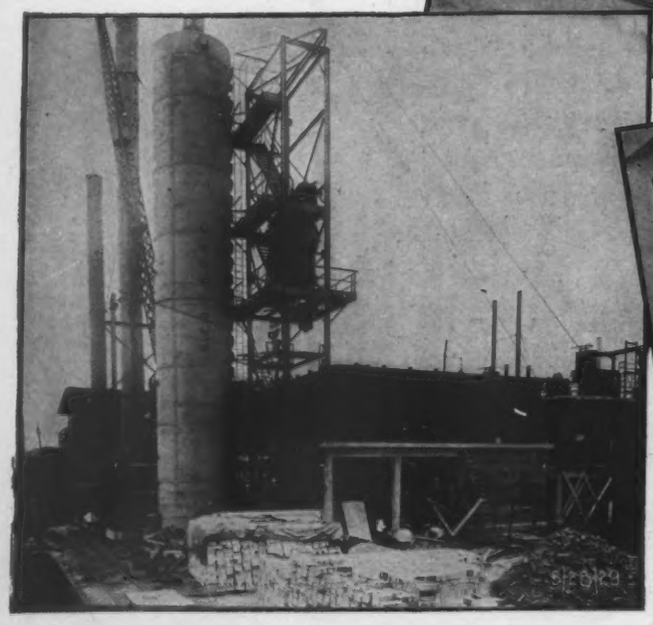
Pittsburgh Chicago New York St. Louis
Detroit Tulsa Houston

Pittsburgh P Seamless

BADGER



Badger distillation units and plants are constructed by a complete organization, handling the work from clear site to operating plant, and backed by an experienced engineering force.



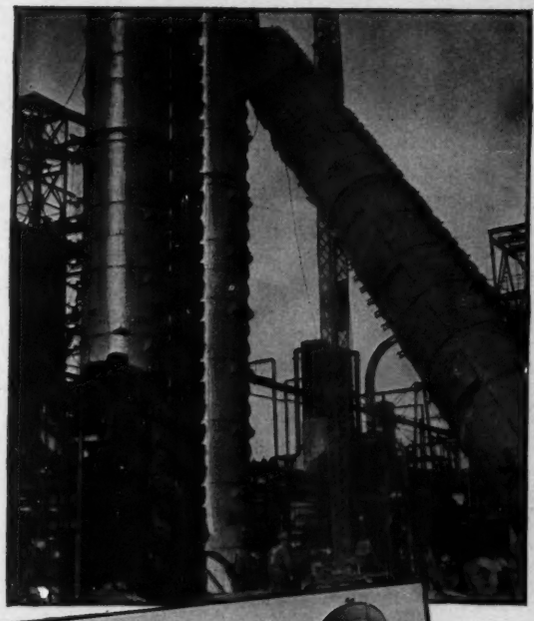
E. B. BADGER & SONS

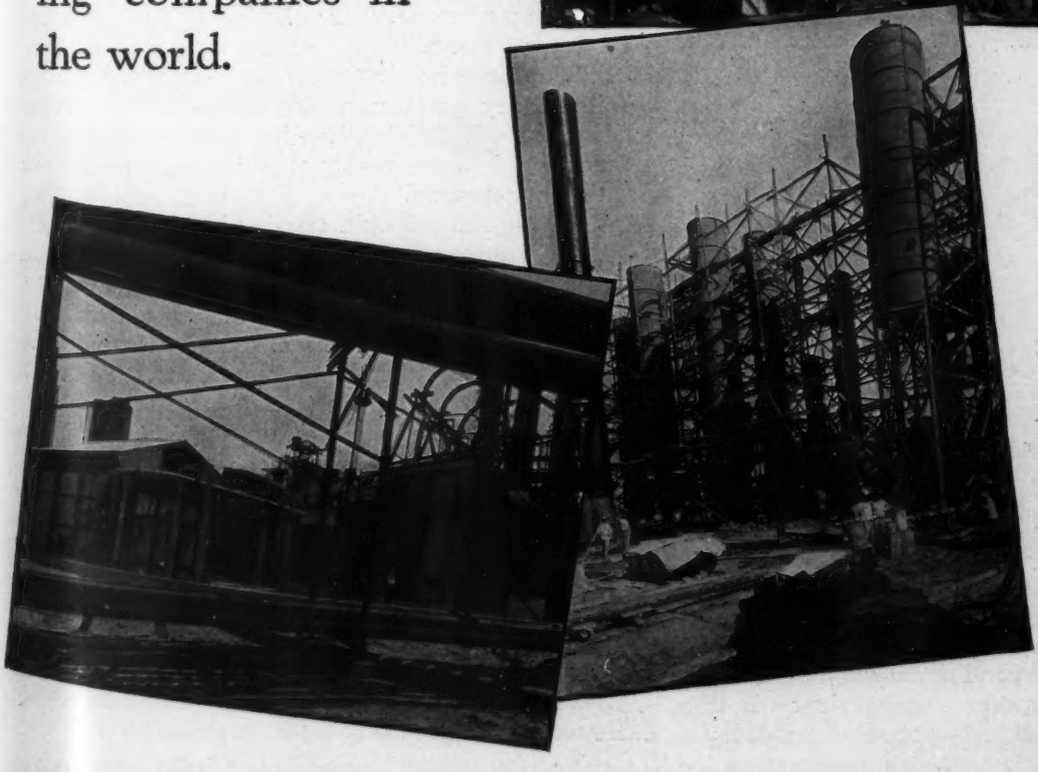
NEW YORK TULSA

CONSTRUCTION ORGANIZATION

This gives our customers the advantages of unit responsibility.

Plants are now being built by our organization for eight of the largest refining companies in the world.





The following Companies are some of those who have purchased BADGER Equipment:

Magnolia Petroleum Co., of Texas
Shell Petroleum Corp.
Craig Oil Co.
Freedom Oil Works Co.
Texas Pacific Coal & Oil Co.
Gulf Refining Co.
Skelly Oil Co.
Phillips Petroleum Co.
Pierce Petroleum Corp.
Tide Water Oil Co.
Anglo-Persian Oil Co., Ltd.
Empire Refineries, Inc.
Marland Oil Co.
Vacuum Oil Co.
Associated Oil Co.
Barnsdall Corp.
Humble Oil & Refining Co.
Tidal Refining Co.
Standard Oil Co. of N. J.
General Petroleum Corp.
Beacon Oil Company
Lubrite Refining Co.
Pennzoil Company
Shell Company California
New Orleans Refining Co.
Emlenton Refining Co.
Independent Refining Co.
Richfield Oil Co.
The Texas Co.
Sinclair Refining Co.

SONS COMPANY

LOS ANGELES BOSTON

PROCEEDINGS OF THE NATIONAL PETROLEUM ASSOCIATION

pound fractures; and the proper method of handling and transporting injured persons.

Although work in the petroleum industry is not considered to be particularly hazardous, yet because of the isolated location of some of the plants where medical attention can be obtained only with difficulty or after considerable delay, it is especially desirable that these workers should have a knowledge of administering first aid to the injured. First aid training in the petroleum industry was first given by the Bureau of Mines, probably in 1921. During May of that year, training was given to refinery employes of the Standard Oil Company at El Segundo, California, and the first training of field employes was given shortly thereafter for the Standard Oil Company at Montebello, California. Shortly thereafter, three of the bureau's cars were engaged in similar work in Louisiana, Texas, Indiana, New Jersey, and Oklahoma.

Early in 1928, I had the pleasure of addressing a meeting of the fire marshals of the National Petroleum Association at Pittsburgh on the subject of first aid, after which arrangements were made for conducting training in the Pennsylvania field. Training was started in April, and during that year, 520 oil workers were instructed in that state.

During the past two and a half years the Bureau of Mines has trained 28,298 men in first aid methods in the oil fields of the following states:

Number of men trained in first aid by the U. S. Bureau of Mines in the petroleum industry, Jan. 1, 1927, to July 1, 1929

State—	1929	1928	1927	Total in 2½ Years
Arkansas	....	59	152	211
California	756	678	3,668	5,122
Colorado	74	....	154	228
Illinois	277	1,707	811	2,795
Indiana	1,487	1,354	....	2,841
Kansas	329	....	145	574
Louisiana	61	574	516	1,151
Maryland	....	144	....	144
Missouri	340	....	....	340
Montana	....	....	148	148
Ohio	....	385	4	389
Oklahoma	613	1,625	3,124	5,362
Pennsylvania	....	520	....	520
South Carolina	....	....	44	44
Texas	2,582	279	1,862	5,723
Utah	14	....	28	42
Washington	....	....	86	86
Wyoming	2,061	292	235	2,588
Total	8,594	7,577	10,477	28,298

Many men in addition to those mentioned here have been trained by other agencies and by companies' own instructors. The bureau's recent policy in endeavoring to train every man at a plant has met with gratifying success in both the mineral and petroleum industries. In carrying out the 100 per cent training plan it is first necessary to obtain the full co-operation of the plant officials. "Key men" are then selected from among the officials or employes—men who will take an interest in the work and who are capable of becoming instructors. These key men are given an intensive course of training by a bureau instructor, and as soon as they are capable of taking charge of a class, groups of not more than 20 or 25 men each are organized and a company instructor is assigned to each class. In this way a number of classes may be conducted at the same time, with a bureau instructor supervising the work of all.

Since 1927, 91 plants have been given 100 per cent. first aid training by the bureau, including the following oil refineries:

Empire Oil & Refining Company, Okmulgee and Gainesville, Texas.

Indian Territory Illuminating Oil Company, Seminole.

Carter Oil Company, Seminole.

Sinclair Oil & Gas Company, Seminole.

Barnsdall Oil Company, Seminole.

Continental Oil Company, Glenrock, Wyoming, and Wichita Falls.

Marland Oil Company, Ponca City.

Pure Oil Company, Muskogee.

That the training of all employes of a plant in first aid methods if effective in the promotion of better co-operation between the employer and the employe and in the reduction of accidents is shown by the letters written to the bureau by officials of plants where complete training has been given. Statements from a few of these letters are quoted:

TESTIMONIALS

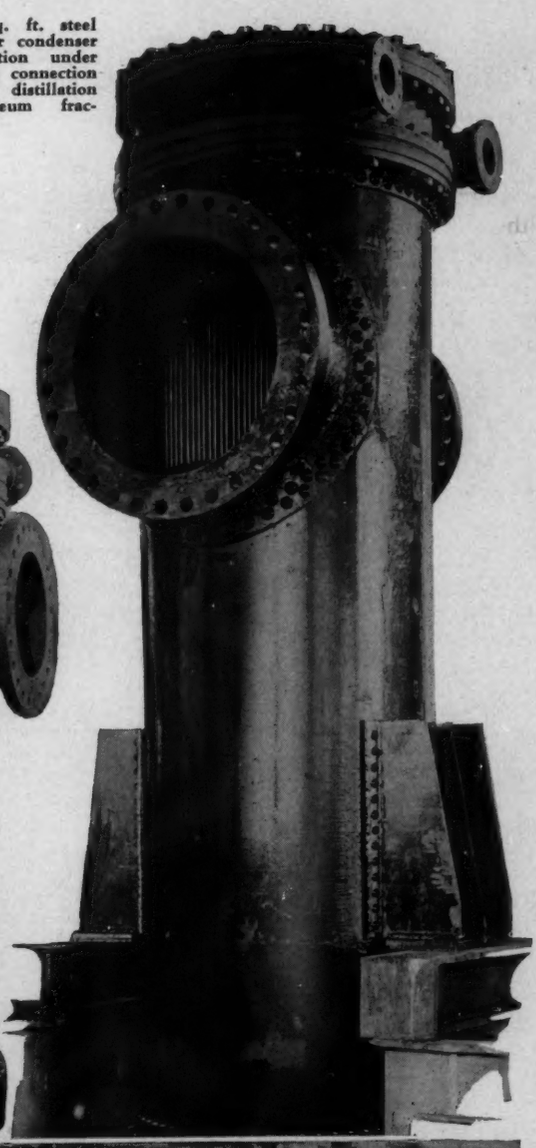
1. "We are indeed pleased with the influence that first aid training has among our employes. We feel that the training itself generally has a tendency to make a more careful workman of the employe and that it builds up co-operation between employer and employe. Without any question, where the major portion have taken first aid training it reduces the number of accidents, which is the most gratifying thing in connection with the movement."

2. "The 100 per cent. training has had its effect in making our men more careful, as we have just completed six successive months without a lost time injury."

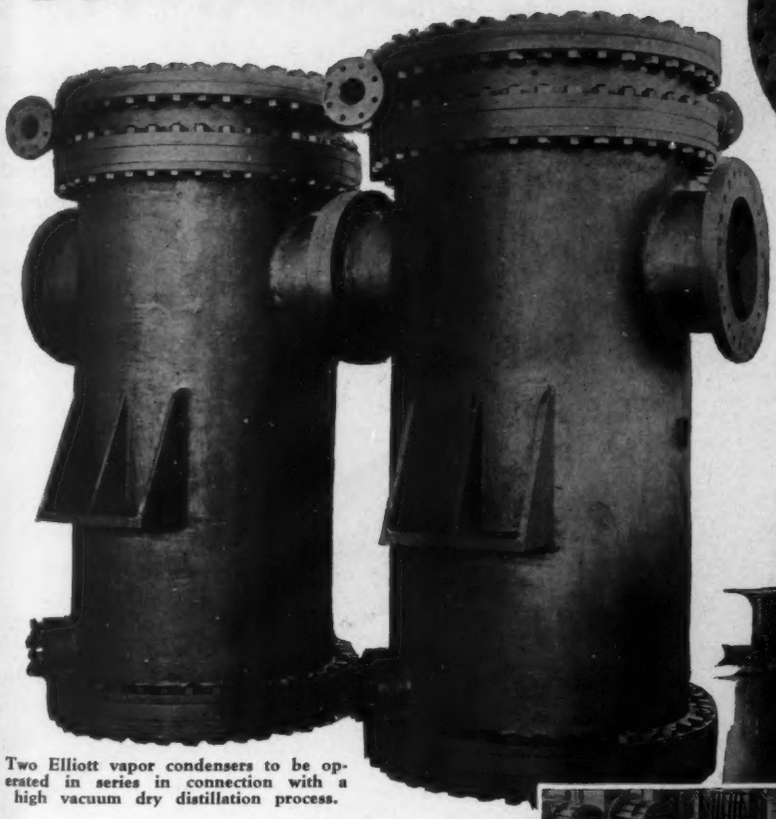
3. "The effect of 100 per cent. first aid training is that more men are reporting minor injuries and are receiving treatment, thereby preventing infection and lost time. We are having less trouble in getting reports of accidents from the employes and they take an interest in reporting dangerous conditions that come under their observation. A much metter understanding exists between the employes and employer. Our reports show an increase in tonnage between accidents which tends to show that the employes are co-operating with the movement. Previous to our 100 per cent. training campaign many of our employes looked on the first aid movement with suspicion, but now the same men are ardent supporters and a more sympathetic feeling exists between the employes and the employer."

These and many similar letters have been received, but these three were quoted to show the results that are being effected through the 100 per cent. first aid training movement. Although first aid training is not claimed to be a panacea for the prevention of accidents in the petroleum or any other industry, it has been positively demonstrated that it is a large factor not only in

Capable heat exchange apparatus—



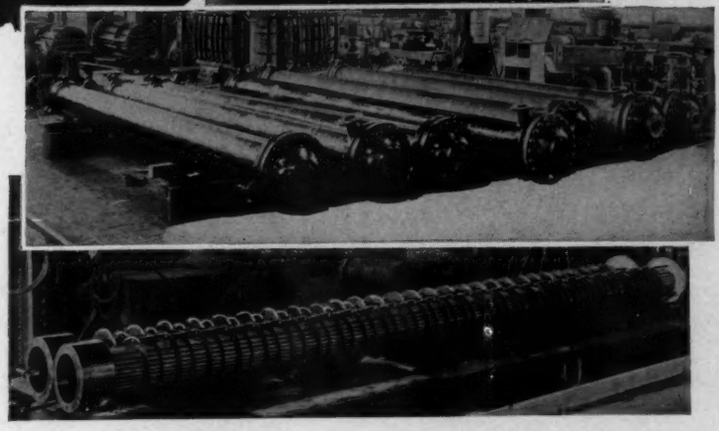
A 300 sq. ft. steel plate vapor condenser for operation under vacuum in connection with steam distillation of petroleum fractions.



Two Elliott vapor condensers to be operated in series in connection with a high vacuum dry distillation process.

Extreme care in details of design and precise methods of manufacturing, are reflected in the excellent results obtained with Elliott Heat Exchangers. In service they achieve low vapor friction loss, complete recovery of condensible fractions, accurate temperature control of fractionating columns. Mechanical excellence of construction prevents air leakage.

Elliott Company builds a complete line of heat exchangers, vapor condensers and ejector apparatus for any distillation project. Elliott high vacuum ejectors used in connection with Elliott high vacuum condensers afford maximum operating economy.



Tube bundles and completed units of part of a shipment of Elliott heat exchangers for a large Eastern oil refinery.

ELLIOTT COMPANY

PITTSBURGH, PA.

General Offices **JEANNETTE, PA.**

Sales Offices in principal cities

Elliott Power Equipment includes turbines and engines, generators and electrical machinery, condensers, deaerators, heaters, centrifugal blowers, and accessory equipment.

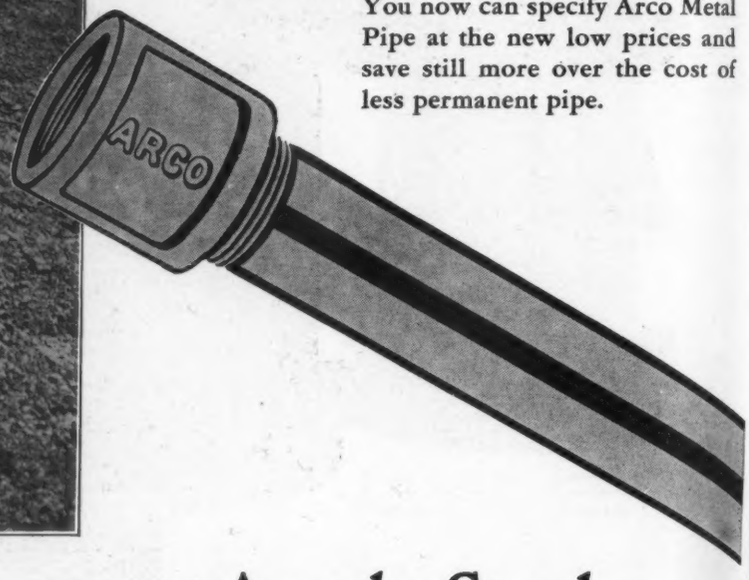
G-257

ARCO

SUBSTANTIAL

Arco Metal Pipe is now available at a substantial reduction in price, due to our greatly increased production of this remarkable product. Everywhere Arco Metal Pipe has been introduced it has met with instant acceptance and approval because of its superior quality, greater flexibility and proved corrosion-resisting characteristics.

You now can specify Arco Metal Pipe at the new low prices and save still more over the cost of less permanent pipe.



Prompt Shipment ✓ ✓ Ample Stocks

Ample stocks of all sizes of Arco Metal Pipe are carried on hand at the Springfield, Illinois, plant, and prompt shipment can be made of any desired size or quantity in the following sizes: 1½″—2″—2½″—3″—4″—5″ and 6″ (same outside and inside diameters as extra strong wrought steel or iron). Shipped in 6 ft. lengths unless otherwise specified. Arco Metal Pipe is distributed to the oil industry by the National Supply Companies and Crane Co., and is carried in stock in the following stores of the National Supply Co.:

Augusta, Kans.	Charleston, W. Va.	Ft. Worth, Texas	Shreveport, La.
Beaumont, Tex.	Cushing, Okla.	Muskegon, Mich.	Torrance, Calif.
Blackwell, Okla.	Duncan, Okla.	Newark, Texas	Tulsa, Okla.
Borger, Texas	Eldorado, Kans.	Okmulgee, Okla.	Toledo, Ohio

AMERICAN RADIATOR COMPANY

INDUSTRIAL DIVISION
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40 West 40th Street
NEW YORK CITY

935 Kennedy Building
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LOS ANGELES

Plant at Springfield, Illinois

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METAL PIPE

PRICE REDUCTIONS NOW IN EFFECT

Corrosion-resisting, flexible, easily cut and threaded

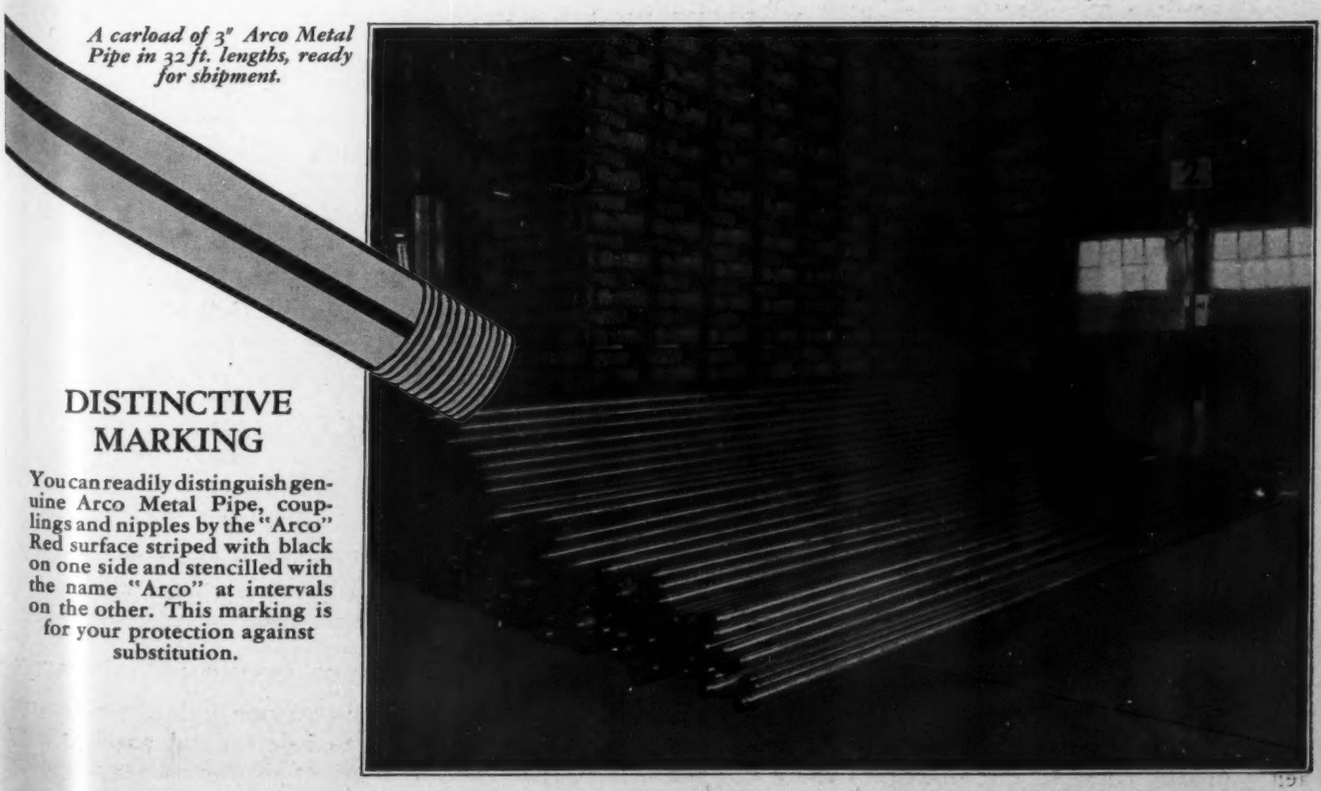
Arco Metal Pipe is a close-grained special analysis nichrome alloy cast iron pipe. Arco Metal Pipe resists corrosion. It may be run underground, submerged in fresh or salt water, or exposed to weather or chemical action that would shorten greatly the life of other pipe.

Arco Metal Pipe has overcome many of the objections to the use of cast iron. It may be used wherever cast iron pipe is specified, and in many cases to greater advantage. It is extremely flexible, remarkably true to dimension, and smooth inside and outside. Its light weight makes it easy to handle. It can be welded into any desired length, and furnished plain end, threaded end, beveled for welding or grooved for special couplings.

Arco Metal Pipe can be cut and threaded at any point within its own length with standard hand or power tools. In cutting, the end comes off with a clean break after four or five turns of the cutter, and no reaming is necessary after cutting. Any standard type of screwed fittings may be used in connection with Arco Metal Pipe.

When welded, tests have proved Arco Metal Pipe to be even stronger at the weld than the body of the pipe. Welds can easily be made right on the job, or Arco Metal Pipe can be ordered welded in any desired lengths from the plant.

A carload of 3" Arco Metal Pipe in 32 ft. lengths, ready for shipment.



DISTINCTIVE MARKING

You can readily distinguish genuine Arco Metal Pipe, couplings and nipples by the "Arco" Red surface striped with black on one side and stencilled with the name "Arco" at intervals on the other. This marking is for your protection against substitution.

PROCEEDINGS OF THE NATIONAL PETROLEUM ASSOCIATION

reducing loss of life or of limb, but also in reducing the number of minor injuries received by workmen.

The value of first aid training, both from a humanitarian and economic standpoint, has been well demonstrated. The Bureau of Mines has on record numerous instances where a knowledge of first aid has been the means of saving lives or relieving suffering.

An official of a large petroleum company estimates that 300 lives were saved during 1926 and 1927 by artificial respiration in the Mid-Continent field.

A letter received from the safety engineer of a large California petroleum company states that the benefits derived from training 1451 men in first aid are most encouraging, and that the training has resulted in a 50 per cent. reduction in the number of infection cases, 98.5 per cent. reduction in days lost from infections, and 95.2 per cent. reduction in compensation and medical cost from infections, resulting in a gross saving of approximately $73,740 per year by reducing infection cases through wholesale first aid training. He further states that the secondary effect of first aid training has been quite apparent in reducing both the number and severity of accidents, with the result that large financial savings have been brought about.

An electric and gas company in Ohio reports that eight lives were saved during 18 months by first aid treatment.

The Standard Gasoline Company, which operates five gasoline recovery plants in California, has included first aid training in its regular safety program and all employes are required to attend classes conducted by company instructors. This company has effected a substantial reduction in its accidents during the past two years chiefly as a result of their first aid and safety activities. During the last two years the number of accidents has been reduced 90 per cent. and days of lost time 80 per cent.

The foregoing are but a few examples that forcibly demonstrate the value of first aid. A course in first aid not only teaches the worker how to take care of himself in case of accident, but this knowledge tends to make him realize more definitely the hazards of his occupation and this automatically makes him a safer worker.

In conclusion, I would urge, for both humanitarian and economic reasons, that the petroleum industry work toward the end of eliminating accidents and of having every man in the industry trained in first aid to the injured. The United States Bureau of Mines stands ready to co-operate with the members of the National Petroleum Association in not only training part or all of their employes in first aid methods, but in other phases of safety education and accident-prevention work.

The Economic Lesson of 1928-29 In the Petroleum Industry

By JOSEPH E. POGUE
Consulting Engineer

IN 1928 the petroleum industry stored 25 million barrels of oil. In 1929 it is certain that nearly 70 million barrels will be added to inventories. If confronted with these figures alone, without further information, one would conclude that these two years were periods of depression with earnings diminished to the vanishing point. Yet the facts are that both years yielded reasonably good profits to the best managed companies, while the market prices of oil securities on the average advanced 60 per cent. How, then, are we to explain this anomoly—the coexistence of continued overproduction and, at least, moderate prosperity?

The conventional answer to that question would doubtless be to attribute the results to "conservation", that much used and abused word. Yet conservation did not prevent overproduction. It probably staved off chaotic conditions, but it did not bring a profitable price for crude oil. However, the price of crude oil per se is of secondary importance to the industry as a whole, except as a means of stimulating or retarding supply. Revenue, and hence profits, come to the industry largely through the sale of gasoline. Crude oil and its price is purely an intra-industrial matter. The public does not buy crude oil.

In 1928, the income of the petroleum industry was derived approximately as follows:

	Millions of Dollars	Per Cent of total
Gasoline	2,725	68
Kerosene	313	8
Fuel Oil	382	9.5
Lubricants	380	9.5
All others	200	5
Total	4,000	100

This table emphasized the paramount importance of gasoline to the oil business as the all important channel through which its profits are derived.

SITUATION RESULT OF ECONOMIC CONDITIONS

Prior to 1927, the petroleum industry was accustomed to overproduce crude oil and gasoline simultaneously and the prices of the two commodities

Acid and Alkali Washing of Oils

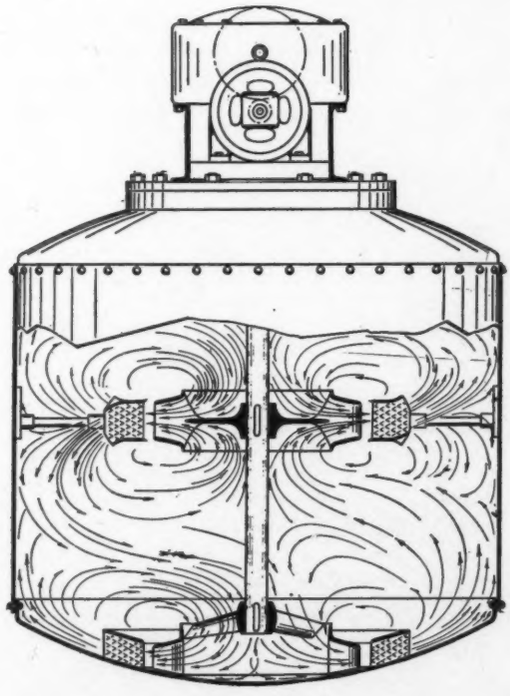
with

THE TURBO-MIXER SYSTEM

If you want to be thorough—If you want perfect results and an improved product use the

Turbo-Mixer

In the continuous Turbo-Mixer System you obtain smooth operation and are always certain that the mixing is 100% perfect.



WRITE FOR FULL INFORMATION!
SEND YOUR PROBLEMS TO US!

and Above All

SEE OUR EXHIBIT AT THE INTERNATIONAL PETROLEUM EXPOSITION, TULSA, OKLAHOMA, OCTOBER 5th TO 12th.

THE TURBO-MIXER CORPORATION

233 Broadway, New York City

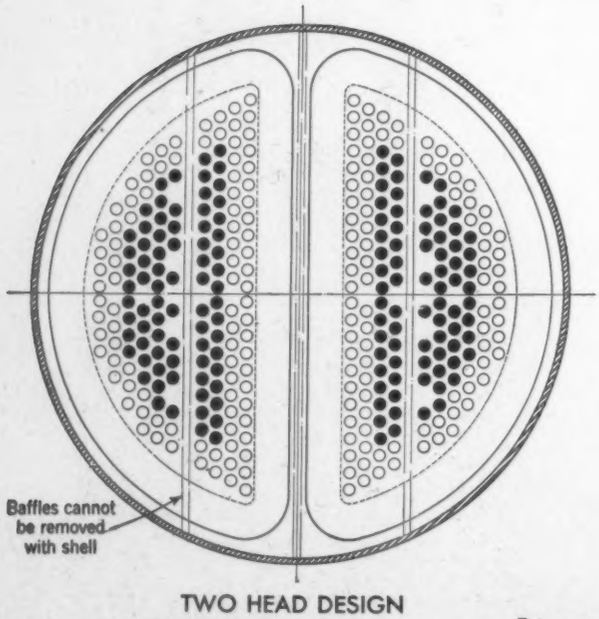
Each Tube Can Be

LEACH Vapor Heat Exchangers for high temperature service have four independent floating heads. There is space between the tube bundles for a man's arm, and only a few tubes are more than one row away from the outside of a tube bundle. Every tube can be reached with a six-inch scraper. A short, stiff scraper will remove coke and tar deposits which would not be touched by a long, flexible scraper, such as must be used in a less accessible bundle. Slight eccentricities in the spacing, or bowing of the tubes in a narrow tube bundle cannot interfere with the scraper, as in a thicker bundle.

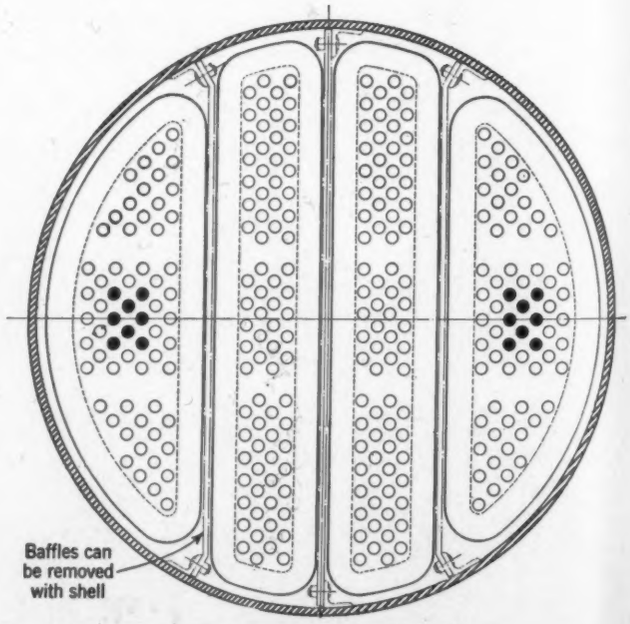
Leach Exchangers are provided with openings in the base casting for flushing out the carbon scraped from the tubes.

THE BAFFLES ARE REMOVABLE WITH THE SHELL. The Leach four floating head design permits the vapor baffles to be permanently fastened to the shell to make a gas tight joint. In a one or two bundle design, the vapor baffles cannot be attached to the shell, but must fit loosely to permit removal of the shell. When the exchanger is cleaned it is necessary to dismount the baffles and slide them out from between the tubes after the shell is removed. Removing and replacing the baffles of a two head unit takes almost as much time as it does to clean a Leach unit. Also, separate baffles cannot be made tight and cannot be made permanent. If the supports are loosened, or corrode, the baffles may lean against the tubes, shutting off vapor flow, and possibly cutting the tube walls.

OTHER ADVANTAGES OF MULTIPLE TUBE BUNDLES. Ease of cleaning is only one reason why multiple tube bundles should be used. There is a wide variation in the temperature of the tubes of



TWO HEAD DESIGN
8 Liquid Passes 4 Vapor Passes



LEACH FOUR HEAD DESIGN
8 Liquid Passes 4 Vapor Passes

Tubes shown in black not easily reached

Fracto Control TRADE MARK REG.
LEACH

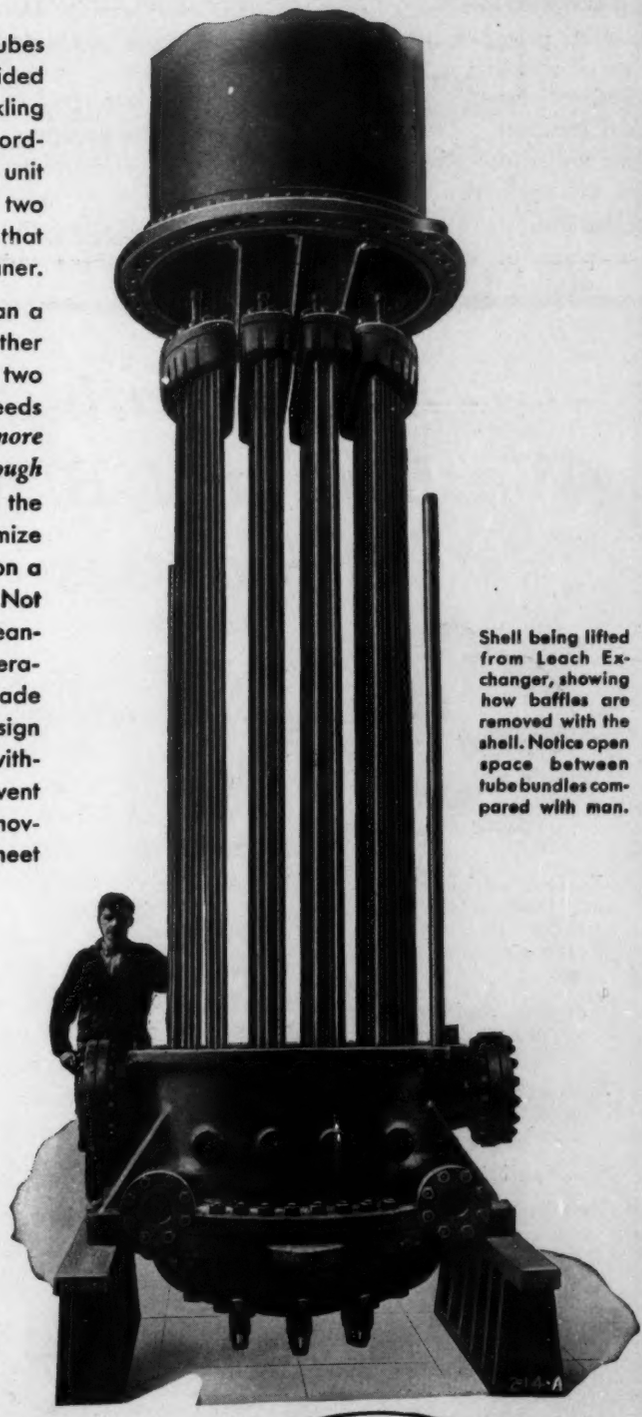
Reached and Cleaned

a heat exchanger under service, and if all the tubes are fastened to a single header, or even if they are divided between two large headers, there is danger of buckling the hotter tubes, or pulling loose the cooler tubes, according to which are in the majority. In starting up the unit these temperature strains are severe in a one or two header unit and the tubes may be buckled so badly that they cannot be cleaned with an ordinary tube cleaner.

EXPENSE. The four header design costs more than a single or two head design. The unit illustrated on the other page requires a 49" inside diameter shell, while a two head unit with the same tube spacing, baffles, etc., needs only a 45" shell. *The four head design does not cost more than a single or two-head design with the tubes far enough apart to be cleaned effectively by a brush,* and has the added advantage of the four floating heads to minimize stresses from tube expansion. Furthermore, upkeep on a four head unit is cheaper than on a two head unit. Not only is the time required for removing the shell and cleaning decreased, but buckling of the tubes due to temperature strains is eliminated. Replacement of tubes if made necessary by corrosion is easier in the four head design as the tubes will hold if merely rolled in at the ends without grooving the tube sheets, as is necessary to prevent pulling out in a single, or two header, design. The removal of a heavy-walled steel tube from a grooved tube sheet is quite difficult.

The success of the Leach design makes possible the recovery of heat from high temperature vapors carrying coke and tar. Over 43 Leach units have been in use in this service for periods up to two and one-half years, and 21 more are under construction.

The Leach Vapor Heat Exchanger is protected by patents here and abroad.



Shell being lifted from Leach Exchanger, showing how baffles are removed with the shell. Notice open space between tube bundles compared with man.

C. H. LEACH CO.

225 BROADWAY NEW YORK

Main Office: Elizabeth, N. J.

LEACH Fracto Control TRADE MARK REG.

PROCEEDINGS OF THE NATIONAL PETROLEUM ASSOCIATION

fluctuated in unison. In 1927, the prices of both suffered a severe decline. But, while over-production of crude oil continued, the decline in gasoline prices retarded the manufacture of gasoline so that 1928 was entered with gasoline in a sound statistical position. Accordingly, in that year we witnessed something new in the oil business—a rise in gasoline prices more or less independently of the price of crude oil. Nineteen twenty-eight, accordingly, turned out to be a reasonably good year, despite continued over-production of crude and despite the fact, also, that refiners began to impair the gasoline situation through over-production in the later months of the year.

The present year opened with both crude oil and gasoline in over-supply, with the trade generally expectant that the demand for gasoline would show about a 40 million barrel increase over the year before, but getting ready to manufacture a 60 million barrel increment. Then a most fortunate thing happened, a gift from the gods, so to speak. The gasoline demand actually turned out to be 14 or 15 million barrels larger than the trade expected, and despite the most vigorous efforts to oversupply requirements, the exceptional demand was not realized in time to prevent the retail gasoline market, at least, from yielding reasonably good profits.

While the gasoline situation in both years was the result of economic conditions, and not to be credited to the acumen of refiners, do we not have in these events a clue to prosperity in the midst of a surfeit of crude oil?

A great deal of time and attention has been devoted to devising means for controlling the supply of crude oil, and the end is not yet. It is not our intention to minimize the urgency of rationalization in this department of business. But we think that the past two years have shown the industry how to achieve prosperity even while they are traversing the long and laborous road that leads to "conservation."

The machinery is all present. The bulk of our gasoline is manufactured by relatively few companies. The demand for gasoline can be forecast; if not accurately, at least it can be underestimated, a most profitable error, as 1929 has demonstrated. The seasonal variation in the consumption of gasoline is accurately known. And now, thanks to the good offices of the American Petroleum Institute, the industry has available on Wednesday of each week, the stocks of gasoline as of the close of the previous week. The only additional ingredient needed in order to manufacture gasoline to meet, not exceed, the demand, is an advance in the art of collective management. And if gasoline is not over-produced, the industry can make money, whatever the zealousness of the crude oil producer.

We hope eventually to see the offset well acquitted of the accusation of responsibility for all the evils of the oil business.

For Treating Washing and Blending Processes

Outlet End

Duriron acid-proof Mixing Nozzles are recommended for:
Treating gasoline or light oil.
Treating crude oil for settling out water, basic sediment, etc.
Treating crude charge stock for lessening coke forming.
Treating bright stock.
Blending for initial boiling point and end point.
Treating casing head, (lime process).
Blending fuel oil and sludge.

Inlet End

DURIRON Mixing Nozzles are sucessfully used for the treating of light oils and lube stock, blending and making up emulsions. They afford a better mixture with about one third of the pressure drop required for orifice plates.

Maintenance expense is eliminated, as Duriron is chemically inactive to the corrosives used in the refinery; and it is so hard that its surfaces are not scored by high velocities. These nozzles are inexpensive.

Duriron Mixing Nozzles are easily and quickly adapted to any treating process. Made in 4", 6", 8", 10" and 12" sizes.

"Duriron in the Refinery" has complete details. It's yours for the asking.

The Duriron Company, Inc.
Dayton, Ohio

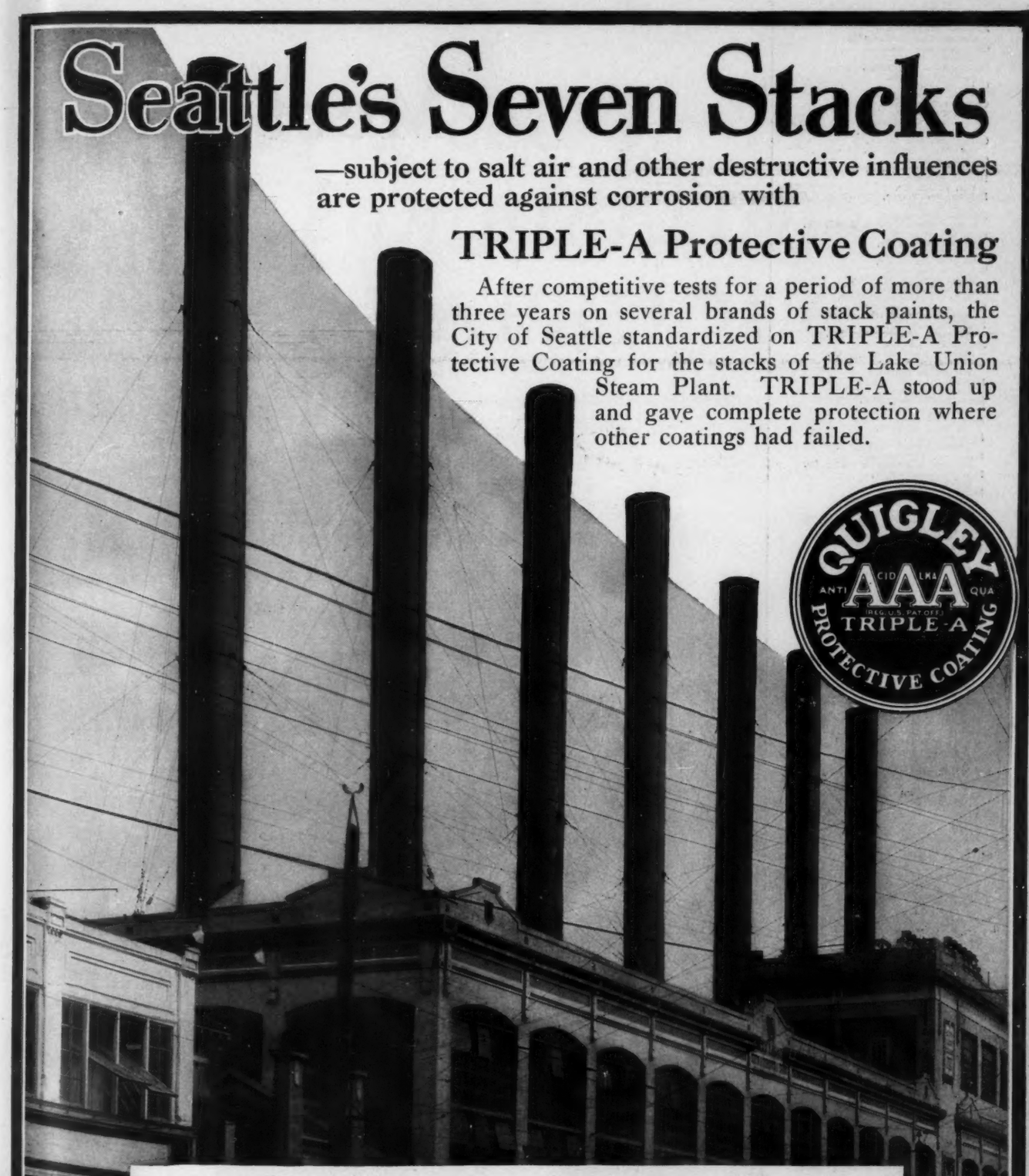
DURIRON
FOR ACID SERVICE

Seattle's Seven Stacks

—subject to salt air and other destructive influences are protected against corrosion with

TRIPLE-A Protective Coating

After competitive tests for a period of more than three years on several brands of stack paints, the City of Seattle standardized on TRIPLE-A Protective Coating for the stacks of the Lake Union Steam Plant. TRIPLE-A stood up and gave complete protection where other coatings had failed.



TRIPLE-A Protective Coatings

are used in power plants for stacks, breechings, boiler fronts, coal bunkers, structural steel work, piping systems, machinery and concrete work. They adhere firmly to metal and concrete surfaces and resist the action of destructive atmospheres.

TRIPLE-A Protective Coatings are acid, alkali and moisture proof. They dry quickly, prevent corrosion of metal surfaces and erosion of concrete.

Twelve Standard TRIPLE-A Colors

can be used to identify Piping Systems, in accordance with the approved scheme of the American Engineering Standards Committee. A decorative color plan affording full protection of equipment can also be used on generating units and auxiliary equipment as well as on floors, walls and foundations. Ask for Test Sample and Booklet S121.

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INCORPORATED

56 West 45th Street **New York**

REFRACTORY MATERIALS FOR FURNACE CONSTRUCTION AND MAINTENANCE
ACID PROOF CEMENTS ACID AND ALKALI PROOF COATINGS

Stock and Service through Agents in Every Industrial Center

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Meet Every

ADAPRODUCTS

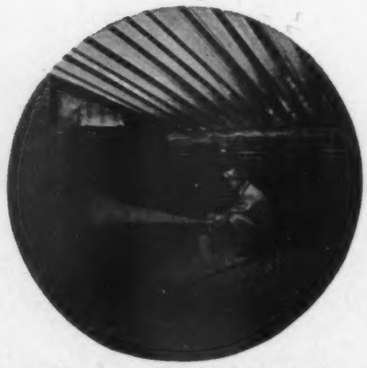
A Refractory to Meet Every Condition in the Petroleum Refinery

ADACHROME *Fines* (for mixture with ADAMANT Cement and use in laying up fire brick where severe conditions are met) comes in dry form in 125 lb. paper-lined burlap bags.

ADAMANT, the *original* high temperature cement, comes in air-tight metal containers weighing 100 lb., 250 lb. and 400 lb.

ADACHROME *Aggregate* (for mixture with ADAMANT Cement and use as surface coatings or for patching work) comes in dry form in 125 lb. paper-lined, burlap bags.

ADACHROME Plastic Super-Cement is the super-refractory bonding material for severe furnace conditions. It is shipped in air-tight, metal containers. Ask for complete information about it when you visit the Tulsa Exposition, or write us.



Keep your still walls and boiler settings in continuous good condition by frequent application of protective surfacings of Mixtures of ADAMANT - ADACHROME *Aggregate*, blown on with the ADAMANT Gun (Price only $25.00). These surfacings fill up and seal brick pores and joints, giving the brickwork a highly-refractory coating that resists the attack of destructive elements. Write for suggested Mixtures suited to your own individual conditions.

ADAPATCH, fire brick in plastic form, is used for patching and repairing burned-out or torn-out sections of brickwork. It is shipped ready mixed in 200 lb. and 500 lb. air-tight, metal containers.

Refinery Need *from the complete line of* ADAPRODUCTS

BOTFIELD Refractories Company pioneered the production of high temperature fire brick cement nearly a quarter-century ago. Its initial product, ADAMANT Fire Brick Cement, was the *original* high temperature cement, and also the original ADAPRODUCT — the forerunner of the present-day complete line of ADAPRODUCTS.

The Botfield line of ADAPRODUCTS includes refractories to meet every need of the petroleum refinery:

ADAMANT Fire Brick Cement, the ideal bond for normal conditions;

ADACHROME Plastic Super-Cement, the Super-Refractory bonding material for use where severe conditions are met;

ADACHROME *Fines*, a chromite refractory, for mixture with ADAMANT Cement and use as a bonding material where exceptional refractoriness is required;

ADACHROME *Aggregate*, also a chromite refractory, for mixture with ADAMANT Cement and use as surface-coatings and patching mixtures;

ADAPATCH, fire brick in plastic form, a ready-mixed material for quick-patching and repairing;

The ADAMANT Gun, a low-priced and efficient spray for the application of protective surfacings on fire brick construction.

From this complete line of ADAPRODUCTS, petroleum refineries can choose the proper product to meet every individual refractories condition. May we tell you how ADAPRODUCTS will help you to prolong refractories service and reduce maintenance costs? Write us today, and ask for a copy of the new book on ADAPRODUCTS.

AT TULSA

When you visit the International Petroleum Exposition at Tulsa from October 5th to 12th, stop at the ADAPRODUCTS Booth, No. 32 in the Scientific and Technical Building. Our representatives will gladly give you complete data on the use of ADAPRODUCTS, and explain how they can be of service to you.

BOTFIELD REFRACTORIES CO.

World's Largest Exclusive Manufacturer of High Temperature Cement

Swanson and Clymer Streets, Philadelphia, Pa.

For a Long Furnace Run, Use The ADAMANT *Gun*

ADAMANT FIRE BRICK CEMENT

Whenever You Use a Fire Brick, Use ADAMANT, *the Original High Temperature Cement*

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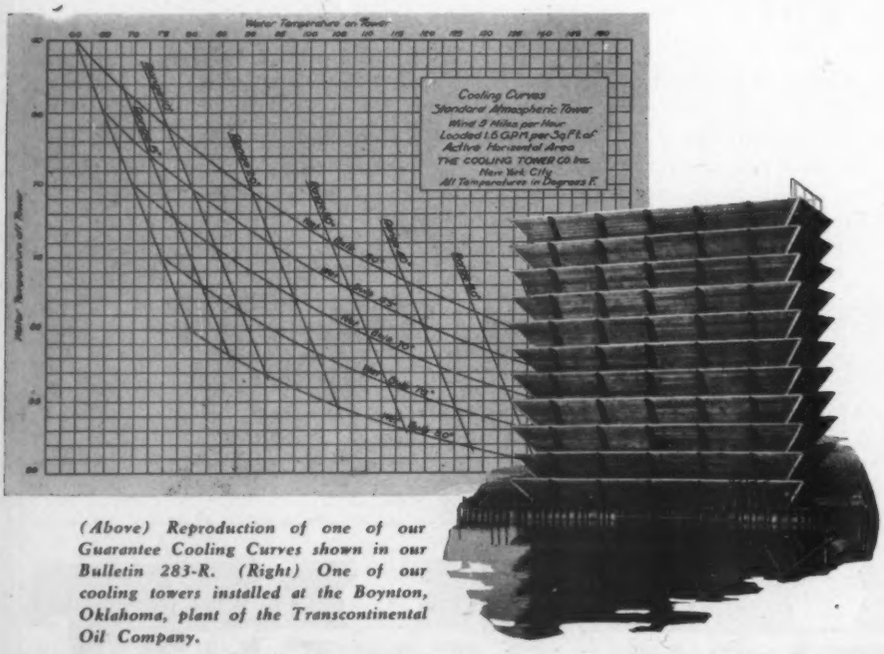
We Guarantee the Performance of Our Cooling Towers and Spray Ponds

WHEN you buy a cooling tower from us you know definitely—in advance—what cooling results you are going to get under given atmospheric conditions. We guarantee these results.

Our cooling towers are rated, not in a misleading number of gallons per minute, but in square feet of active horizontal area (i.e. the area of one deck). A gallon-per-minute rating varies with the amount of water circulated per minute per square foot of area.

Our *Bulletin 283-R* shows two cooling curves—one with a loading of 1½ gallons per minute per square foot of active horizontal area, the other with a loading of 2¼ gallons per minute. You will certainly want this bulletin for your files, also our *Bulletin 282-R* on spray nozzle cooling systems. Both bulletins will be sent on request.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Wind 9 Miles per Hour
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Active Horizontal Area
THE COOLING TOWER Co. Inc.
New York City
All Temperatures in Degrees F.
Water Temperature off Tower

(Above) Reproduction of one of our Guarantee Cooling Curves shown in our Bulletin 283-R. (Right) One of our cooling towers installed at the Boynton, Oklahoma, plant of the Transcontinental Oil Company.

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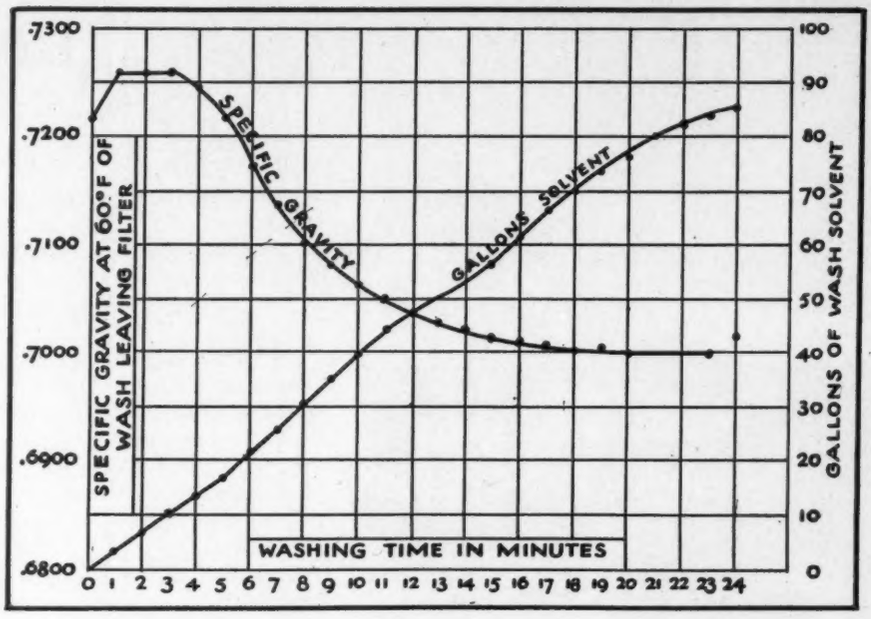

Note:

1. Uniformity of line.
2. Evenness of cake.
3. Smoothness of washing.
4. Washes completely clean with minimum of time and solvent.

VALLEZ ROTATING LEAF FILTER

THE Vallez works in a closed system, never being open during operation, thereby avoiding solvent losses and dust, and minimizing fire hazard.

The Vallez operation of filtering is immediately followed by a washing with solvents. This washing is thorough because of the uniform thickness of cake, due to rotating leaf, and requires a minimum of solvent.

The solvent can be entirely steamed from the cake in the filter, if desired.

The capacity is large because of high filtration rate and minimum time for blowing and dumping.

You know how dusty the dumping of a washed Fuller's Earth or any other absorbent has been. In Vallez filter operation there is no dust.

The Vallez is not opened to discharge and the hopper underneath is covered.

Many Vallez filters are used successfully in dewaxing operations, with the aid of volatile diluent.

WE BUILD

High Duty Vacuum Rotary Filters
Pressure Filters, Kilns,
Evaporators, Stills,
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Main Office and Works: Birmingham, Alabama
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Joseph E. Pogue, Consulting Engineer.

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H. W. Schmidt, United Refining Company.

R. M. Shanklin, Crew Levick Company.

Geo. Otis Smith, U. S. Geological Survey.

A. T. Smith, The National Refining Company.

R. G. Sonneborn, L. Sonneborn Sons Incorporated.

Lacey Walker, American Petroleum Institute.

S. P. Worthington, Tiona Petroleum Company.

E. F. Griswold has been appointed sales manager of the Burford Oil Company of Pecos, Texas. Mr. Griswold has been in the refining business 12 years in North and West Texas.

NAME CHANGED

The Smith Engineering Company (Pennsylvania) has been formed through a change in the name of Smith & Leslie, Inc. The office of the corporation is in the Drake Theatre Building, Oil City, Pennsylvania, with engineering, accounting and general sales office at 107 West Inwood Boulevard, Kansas City. Territorial sales offices are located in Oil City, Kansas City, Tulsa, New York, Chicago and Los Angeles.

The Union Chain & Manufacturing Company, Sandusky, Ohio, has recently announced the appointment of Alan G. Cary of the Alan G. Cary Company, 204 Endicott Building, St. Paul, Minnesota, as its St. Paul and Minneapolis representative. This follows the recent merging of the above company with the American High Speed Chain Company of Indianapolis.

Here brine is held below—30°F

—30°F is all in a day's work for this Carbondale Compression Refrigerating System. Temperatures below this are the rule and they must be maintained continuously and with full brine capacity, always. Low cold test oils demand real performance from refrigerating systems. In many of America's leading refineries, Carbondale has been assigned the job and has cooperated to fulfill the need regardless of the temperature or capacity required.

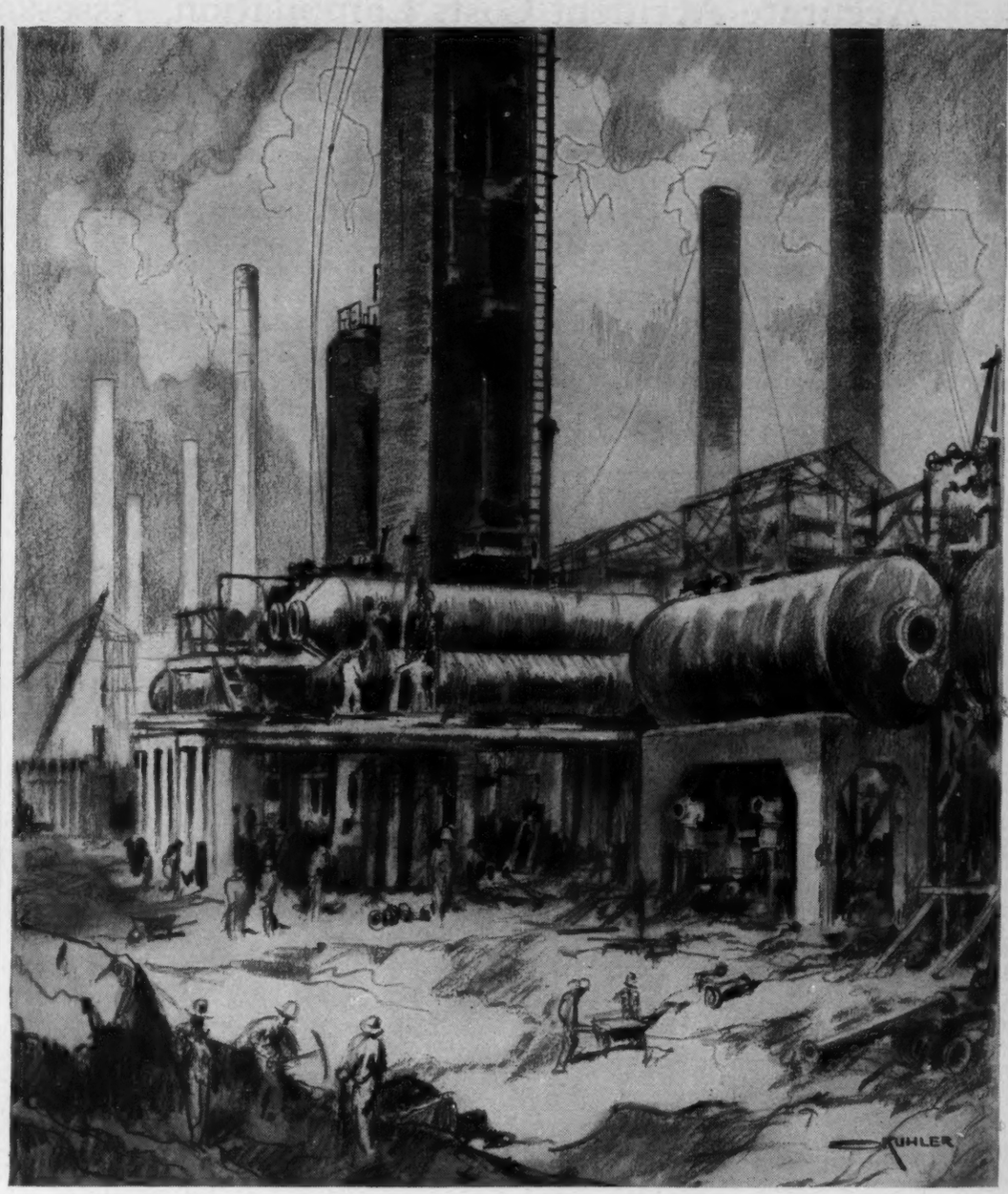
Such cooperation was to be expected because for more than 37 years Carbondale has kept abreast of the ever changing demands of the refineries and has successfully satisfied the many varied demands both for absorption and compression systems.

THE CARBONDALE MACHINE CO., Carbondale, Pa.

Branches in principal cities

Carbondale Refrigeration

CARMACO *for Refiners*



From SHELL STILLS FIFTEEN YEARS AGO, TO COMPLETE REFINERIES TODAY

Since the first Kellogg shell stills were produced 15 years ago, the progress made in petroleum refining has been revolutionary. One after another, old ideas and old practices have been condemned and discarded. Always abreast of current requirements, Kellogg oil technologists have contributed no small share to the science of petroleum refining. Kellogg service now includes designing and constructing complete refineries anywhere in the world.

The M. W. KELLOGG COMPANY

225 Broadway, New York

HOUSTON, TEXAS, 1514 PETROLEUM BLDG. LOS ANGELES, CAL., 1031 SO. BROADWAY TULSA, OKLA., PHILTOWER BLDG.

Accurate Accident Costs Compilation, Assessments and Presentations

(*Continued from page* 88)

ACCIDENT COST STATISTICS

The development of accident costs on the basis of the dollar payroll naturally leads to the whole question of the presentation of accident cost statistics. It is important that costs be submitted in concrete fashion, easily grasped by operating men. It is important, too, that boards of directors realize in cold dollars and cents the cost of accidents so that they may make adequate provision for accident prevention programs in annual budgets.

The most common methods used in petroleum companies include the following:

a. Accident cost per case.
b. Accident cost per $100 of payroll or percentage of payroll.
c. Accident cost per unit of production, manufacture, sales.
d. Total saving in accident costs in relation to amount of capital investment.

The first, accident cost per lost time accident or case, is simply ascertained by dividing total costs by number of lost time accidents. Usually these figures are compiled, with and without the inclusion of fatalities, since the frequency or absence of death cases distorts the general curve of accident case cost. (See the table 1).

Accident cost per $100 payroll (or percentage) has already been described in detail. It is generally regarded as the most effective way of ascertaining accident cost trends. The only concrete objection apparently lies in the fact that while payrolls may increase through upward wage revision without increase in the number of employees, accident costs remain more or less stable, and thus a somewhat false percentage is derived. At the same time, this objection may be partially overcome by the fact that accident costs, in turn, may be increased by higher payments under workmen's compensation laws, increased severity of commission decisions in contested cases, etc. When all is said and done, however, the accident cost rate on the payroll basis does show concretely dollar cost to dollar payroll — and that is a most poignant way to reflect accident progress.

Accident costs per unit of total barrels of production, pipe line runs, or total gasoline sales are not generally used since the fluctuation in these units are so variable. For example, a fairly high accident cost might occur in a producing department at a time of curtailment; and lower costs in a period of expansion. The same criticism also holds true in manufacturing and sales.

The total cost of accidents in one of these major departments however, levied against the individual unit such as a barrel of production or gallon of gasoline, is an effective means of informing both employees and executives the direct cost of accidents. If for example a producing department puts out 10,000,000 barrels of petroleum per year, and in-

Don't think that you are getting the benefit of all the steam created simply because you have a few steam traps. Unless *every* line where condensation collects is trapped, and trapped *efficiently*, much of the money spent for fuel to make steam is wasted.

Because of the low cost of Sarco Steam Traps—1/3 the price of most makes—it is inexpensive to put a Sarco at every condensation point. In this way steam waste is prevented throughout the entire system. That saves fuel and makes less work for the engineer and fireman.

Sarco Steam Traps can be screwed right into the pipe line, as they require no more space than an elbow. The cost and work of building platform or digging a pit are saved.

They are self-adjusting to any steam pressure from 0 to 100 lbs. There is no danger of freezing, for they automatically drain when steam is off and close to prevent loss of steam when the steam goes on again. The valve has Monel metal cone and seat for maximum durability in service.

Send for a Sarco on FREE trial. If you wish to return it at the end of 30 days, you don't owe us one cent. Mail the convenient coupon.

SARCO CO., Inc.

183 Madison Ave., New York, N. Y.

BOSTON CHICAGO DETROIT PITTSBURGH
BUFFALO CLEVELAND PHILADELPHIA ST. LOUIS
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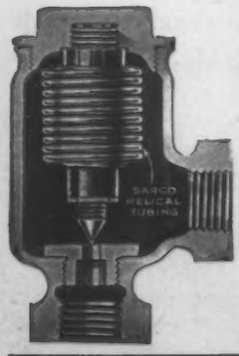
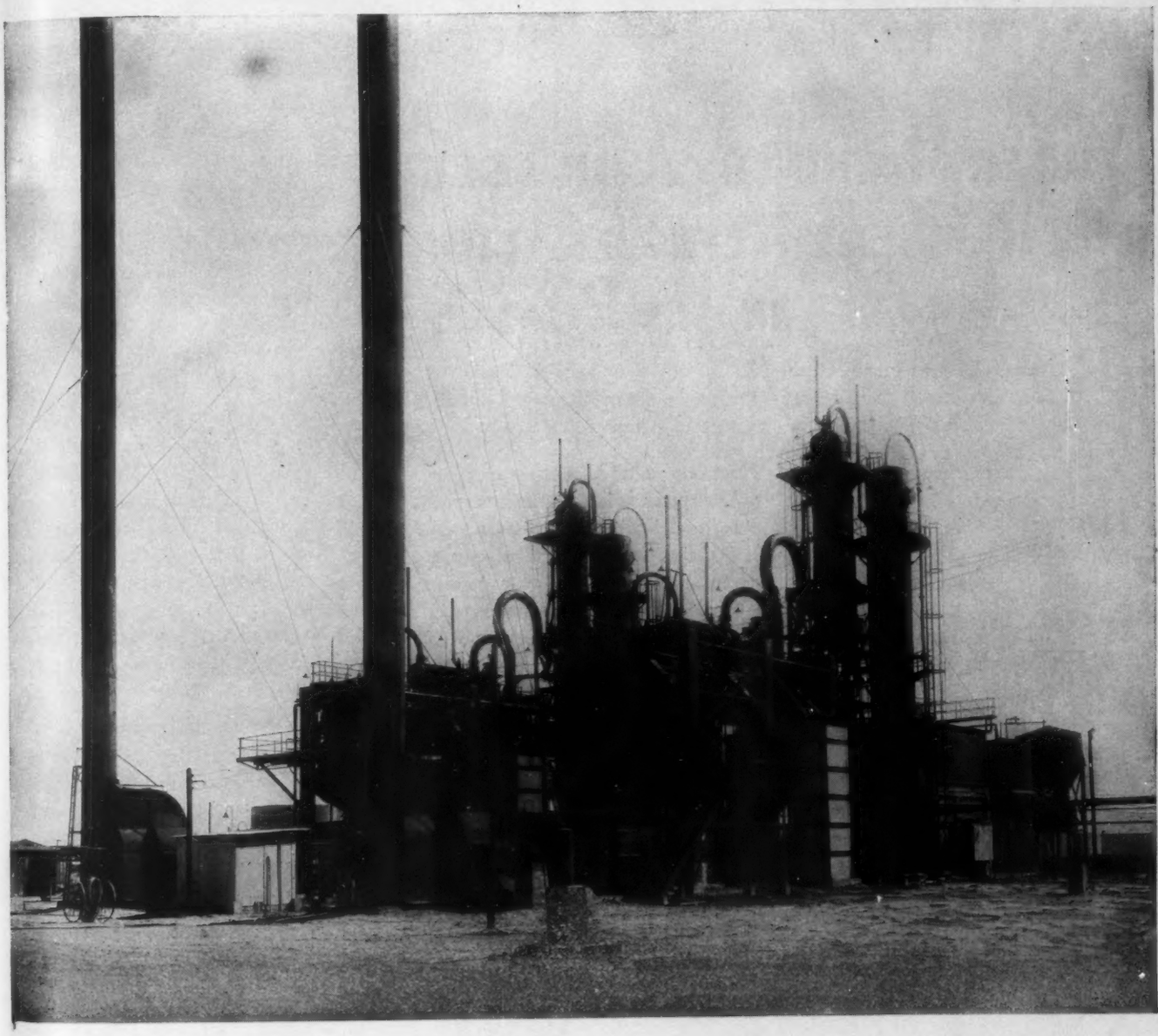


SARCO STEAM TRAP

SARCO CO., Inc.,
183 Madison Ave., New York City
☐ Send a Sarco Steam Trap on 30 days free trial as follows:
Size ..... for pressure ..... lbs.
☐ Send Booklet No. S-230.
Firm .....
Street .....
City ..... State .....

JENKINS CRACKING PROCESS



A TWO UNIT JENKINS PROCESS INSTALLATION
PECOS REFINING COMPANY
PECOS, TEXAS

~ REFINERY DIVISION ~
GRAVER Corporation
Founded 1857
844 Rush Street ~ Chicago
NEW YORK FORT WORTH LOS ANGELES
Plant — East Chicago, Indiana

VILTER MACHINERY AVAILABLE FOR REFINERY REFRIGERATION IN ALL PHASES

READINESS to serve is but one virtue....it takes real ability and long specialization to fit an organization to cater to an industry so technical as Refining.

Vilter has an experience in precision products since 1867.

Since its inception in 1882 refrigeration machinery has been produced by Vilter.

It is on the sound basis of *knowing how* that we solicit your inquiry.

Regardless of the manner in which you wish to use refrigeration, Vilter engineers can help you or your staff to secure an even more efficient result with even greater economies.... and a thorough knowledge of the refiner's problems is back of this broad statement.

Write or Wire for Data

We shall be glad to have our Engineering Department consulted on any specific matter pertaining to refrigeration or heat transfer. No obligation, of course. 15-29

The VILTER MANUFACTURING CO.
1097 Clinton St.
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WALTER J. PODBIELNIAK—PAUL M. RAIGOROLSLY

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NATURAL GASOLINE PLANT DESIGN AND OPERATION

ANALYTICAL AND RESEARCH LABORATORIES

FRACTIONAL DISTILLATION ANALYSIS

volves $80,000 in accidents in the course of this production, then the accident cost on each barrel of course is eight-tenths of a cent.

A few companies have visualized accident costs on the basis of the total amount of estimated saving (through reduction of accidents) in relation to capital investment. Thus one petroleum company, over a five-year period, saved $70,000 annually in a reduction of accidents. It spent an average of $20,000 in general safety work annually, leaving a credit balance of $50,000. At six per cent this represents some $833,000. Estimated savings in relation to capital investment is truly a graphic way to sell a safety program.

In my opinion, simple statistical average costs per case and per dollar payroll, with estimated saving on capital investment are all effective means of presenting accident costs before boards of directors, comptrollers, and others who hold the money bags of our companies. To make the picture as realistic as possible, all these statistics ought to be used.

To sum up, this paper has attempted to plead first, for more accurate accident accounting through the compilation of "indirect" as well as "direct" accident costs; for the allocation and assessment of accident costs on a departmental basis; for graphic methods of presenting accident cost statistics. The first step must be accepted by operating executives if they are really going to find how much accident costs burden the cost of production, the second step must be followed in order to establish tangible standards to strive for in an accident prevention program; the third step must be followed in order to sell the entire safety program more effectively. Along side of our splendid accident frequency and severity data, let us endeavor to compile accurate factual costs — costs that can weather any storm of criticism directed against a safety budget and program, costs that can reveal both real and hidden losses in production, costs that can measure more precisely human waste through accidents.

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LIBERTY CLEANERS

furnish efficient cleaning service for tubes of any size or type. They have the proper co-ordination between powerful motor and effective cutter head to cut the job of cleaning to a minimum.

Above is shown the double-motor Tandemtype Liberty cleaner with "SF" cutter head giving utmost speed, power and scale cutting ability.

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Made of acid-resisting shale—practically indestructible.

Used by all big producers because of the intensive movements.

Samples on request

B. MIFFLIN HOOD CO., DAISY, TENN.

(*Continued from page* 86)

catch drip oil. Rags must be hung up to dry only in the place provided.

13. Tools when not in use must be kept in the racks and cabinets provided. They should not be left on floors, machinery or walk-ways.

14. The use of iron hammers in any building or place where gas or gasoline vapors might be present is prohibited. Copper hammers are provided.

15. When work is being done in boilers, the "Man in Boiler" sign must be in place. When work is being done in a tank or tank car the "Man in Tank" sign must be in place.

16. The mesh wire guards on gauge glasses must be securely placed at all times.

17. Tanks and tank cars must be free from gas and gasoline vapor before any one enters them. If possible steam them out. Men must not enter tanks or tank cars without gas mask in place and without having ropes attached to their bodies and some one stationed on the outside to operate the mask blower and pull them out in case they should be overcome by gas.

18. None but company automobiles are permitted inside the plant fence or buildings.

19. No persons except officers and employees of this company and federal and state officials or inspectors provided with properly signed and sealed identification cards are permitted inside the plant without a permit from the Tulsa office. All persons not employees of the gasoline department must fill out and sign the "Visitors Application and Agreement."

In summary the major problem of safety may be unequivocally stated to be the question of plant personnel. Common sense prevents accidents and makes for a harmonious organization.

The story of safety can be told neither in a few words nor in a few days. It must be constantly repeated and re-echoed, and revised to meet changing conditions. The biggest thing in life is human relationship. Through the mutual interest in safety work there has grown up between employer, manager and employee a more sympathetic understanding of the reciprocal problems involved in industry, and a greater willingness to co-operate in a common cause, working to a common end.

A *Few* Degrees Make a *Big* Difference!

Their ability to withstand a few more degrees of heat has kept Evens & Howard Fire Brick in the lead for nearly three quarters of a century and made them the logical choice when steady, high furnace temperatures must be maintained for days, weeks and months. You are buying more than mere fire brick when you purchase from Evens & Howard—you are investing in the proven products of one of America's oldest refractory manufacturers.

Clays used in making Evens & Howard fire brick are from our own extensive mines in Missouri, Texas and Georgia: They include all varieties of plastic and flint fire clays, high alumina diaspores and kaolins. Among the following eight specialized brands of fire clay brick, you are sure to find one exactly suited to your special requirements and which will successfully meet the severest furnace conditions known under modern industrial methods.

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Proper Design and Operation of Heat Exchangers

By E. F. KALLAM, M. E. *and* A. F. SEMINO

TABLE OF CONTENTS

The Film Theory of Heat Exchangers
The Resistance Concept

Factors Governing Heat Transfer—
- Type of Flow
- Velocity of Flow
- Relation of Flow
- The Shape Factor
- Pressure Drops
- Vaporization

Physical Characteristics of the Fluids Affecting Heat Transfer—
- Viscosity of the fluids
- Conductivity of the fluids
- Density of the fluid
- Specific heat of the fluid

Types and Classification of Commercial Exchangers—
- Double Pipe
- Concentric
- Multitubular, Manufactured
- General Method of Heat Transfer Solution

Data to be Secured and Used—
- Constructional details
- Experimental data
- Computations

Results

Discussion of Results Conclusions—

Appendix—
- The viscosity of oils
- The specific heat of oils
- Computation of heat exchanger problem
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When respiration has stopped, artificial respiration by the manual prone pressure method should be employed to start spontaneous breathing. This effort should be assisted by administering Carbogen simultaneously from the H-H Inhalator.

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For complete information write for Bulletin No. 80. Demonstrations will be given on request.

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PRODUCTS DERIVED FROM NATURAL GAS WILL BE DISPLAYED AT PETROLEUM EXPOSITION

William S. Waldrip, chief engineer of Neilan, Schumacher & Company, Los Angeles, California, manufacturer of regulating devices and control equipment, is in Chicago. J. M. Coffeen, who has had several years gasoline plant and instrument experience, accompanied Mr. Waldrip from the factory and will establish himself as sales representative of Neilan equipment in Chicago. After leaving Chicago, Mr. Waldrip will go on to New York City and establish a Neilan-Schumacher sales representative there.

Michigan Central Refining Company, Muskegon, Michigan, recently organized as a subsidiary of the Amarillo Producers and Refiners Corporation, Amarillo, Texas, by officials of the latter, has approved plans for the construction of a new oil refinery in the vicinity of Muskegon, to be equipped for an initial output of about 3500 barrels per day. The project will include a complete storage and distributing plant in the district, with initial capacity of over 50,000 barrels.

* * *

Cities Service Refining Company, Boston, is said to be planning to rebuild a portion of its oil refining plant at East Braintree, Massachusetts, destroyed by fire early in June, with loss estimated at more than $225,000.

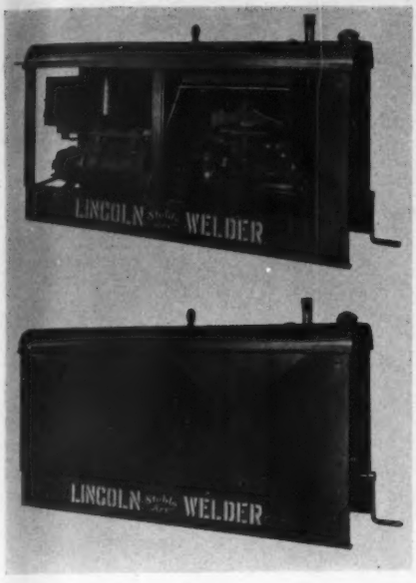
J. A. Campbell of the J. A. Campbell Company, manufacturers of natural gasoline plant equipment at Long Beach, California, returned home August 1 from his annual vacation spent at Oakland, San Francisco and Sequoia National Park. He was accompanied by his family.

Bulletin 4-F, just published by Schutte & Koerting Company of Philadelphia as as new edition to their bulletin under this number, describes the standard hand controlled thermo-compressor and illustrates and describes the automatic thermo-compressor used where regulation is required. This edition to Bulletin 4-F is to be inserted in the recipient's Schutte & Koerting Jet catalog, volume 1, and the 1925 edition destroyed. The edition will be mailed upon request to the company.

Dallas, Texas.—The Primtex Refining Company has installed equipment at its refinery, located near Grand Prairie, west of Dallas, to manufacture about five cars of finished lube oils daily. This plant has heretofore operated as a skimming unit, with a capacity of 1500 barrels daily, and will continue to manufacture gasoline along with lubes and waxes, using crude from Brown County and West Texas fields. John Muense is superintendent in charge of operations, and headquarters of the company are located in the Central Bank building, Dallas.

F. G. D. Muller, vice president of Staytite Company, Houston, spent a vacation with his family in Europe, visiting relatives from June to September. They visited in Holland, Austria, Germany and England.

NEW EQUIPMENT, CATALOGS, BULLETINS, BOOKS



Lincoln Welder

Gas Engine Driven Welder

LINCOLN ELECTRIC COMPANY

The Lincoln Electric Company, Cleveland, has recently introduced to the trade a new model gas engine driven welder for use where electric power is not available. The new model welder is of 200 amperes N. E. M. A. rating and is powered by a four-cylinder Waukesha engine, operating at 1500 r. p. m.

The latest improvements which are featured in the new improved models of Lincoln gas engine driven welders are included in this new model. An automatic idling device is incorporated which automatically reduces the speed of the gas engine, when welding operations cease and automatically accelerates the engine to proper speed, as soon as welding is started. It is estimated that this automatic idling device will reduce fuel consumption approximately 25 per cent., as well as considerably reduce wear in the welder, which will permit longer life of the equipment.

Another feature of this new model welder is the protection afforded the machinery by the welded steel canopy which totally encloses the outfit.

Unified control, a feature of all new improved "Stable-Arc" welders, is also incorporated in this new model. Operating controls are enclosed in a ventilated steel cabinet.

Removable Orifice Flange

B. V. EMERY & COMPANY

B. V. Emery & Company, Tulsa, is now marketing its removable orifice flange, a product designed to meet the need of an inexpensive fitting which would duplicate the conditions existing in the usual orifice flange and which would enable the orifice plate to be changed without the use of a by-pass.

The plate is clamped between two finished surfaces in such a way that the regular thin orifice plate can be used without danger of plate distortion, the manufacturers state. Three jack screws do not bear directly against the plate, but against a tight-fitting movable ring which clamps the plate into the body.

The same jack screws which clamp the plate in position are also used to seal off the plate when it is raised to the upper part of the flange, thus allowing a new plate to be inserted without gas leakage.

GATE VALVE BOOKLET

A 62-page booklet showing sectional and exterior views as well as dimensions and price lists of advanced type gate valves is being distributed by the Pittsburgh Valve, Foundry & Construction Company, Pittsburgh, manufacturers of a complete line of valves to meet steam, oil and gas line conditions.

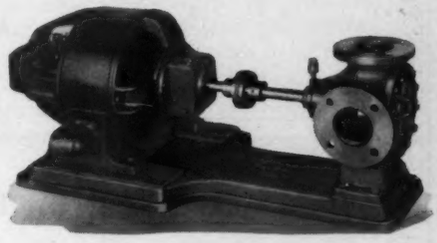
Portable Welder

PONTIAC TRACTOR COMPANY

The new Lincoln Stable Arc Welder mounted on the McCormick-Deering Tractor has just been announced by the Pontiac Tractor Company of Pontiac, Michigan.

This unit is furnished in either the 200 or 300 ampere machine and gives a wide range of utility.

The extension frame in this mounting is such that the tractor is set into a four-inch I-beam frame and the front axle assembly is set ahead under the frame, thereby lengthening the wheel base. This construction reinforces the tractor and gives it balance making it easy to steer with the added weight. The welder unit complete with the panel is mounted on this frame member ahead of the tractor and takes its drive from the power pulley at the side of the tractor by a belt. This makes a compact self contained unit capable of moving about under its own power. The 48x4-inch dual tires used in the rear give this unit a road speed of 15 miles per hour.



Tuthill Pump

New Pumps

TUTHILL PUMP COMPANY

The Tuthill Pump Company, 131 West 63 Street, Chicago, is building two new pumps of 100 gallons and 200 gallons capacity per minute.

Model 7-C and 8-C are high speed positive displacement pumps of the internal gear type, built to operate up to direct motor speeds at pressures of 100 pounds per square inch or less.

Both pumps may be driven effectively in either direction of rotation, eliminating the need of considerable manifolding. The rotor and shaft are solid steel forging with no key used. The stuffing box is designed to prevent scoring of the rotor shaft through excessive gland pressure.

They are made for use in skimming plants, where the pumping unit will serve many purposes, as crude oil from storage to still and distilled prod-

Pontiac Portable Welding Unit

Address Inquiries to Any Member Listed Below

Elgin Butler Brick Co., Austin, Texas

Acme Brick Company, Fort Worth, Texas

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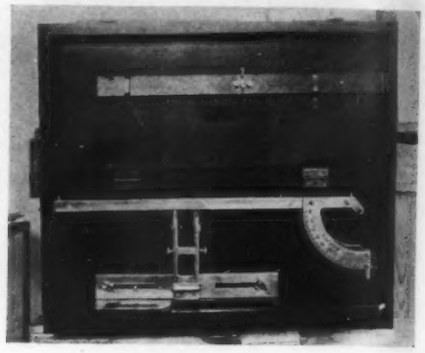
ucts from run-down tanks to filters or storage or for loading and unloading purposes. In the large refineries, the pumps may be used for all lube oil movements, for wax plant operations, for removing sludge and for transferring pressure distillates to pressure stills.

The accompanying photograph shows the Model 7-C general purpose pump of 100 gallons per minute capacity. Further information is available upon request to the company at the above address.



Angle and Plane Projector

Angle and Plane Projector

REFINERY SUPPLY COMPANY

The Refinery Supply Company's new Ac-Me angle and plane projector for marking angle cuts necessary on pipe in constructing welded systems of pipe line is an aluminum base carrying aligning points for the welder's use in aligning the instrument with the pipe.

Protractor scales Nos. 1 and 2 for locating the proper angle for cut are attached to the base. A small level protractor for setting the base at the proper angle with the horizontal is attached to the front of the plane. By pivoting the arms of the plane on the front of the base their positions are given on the protractor. Provision is made with the instrument to properly mark the pipe after the points of cutting have been located.

A photographic illustration of the instrument given here shows it in its portable case. It weighs only 3¼ pounds, and is designed to save time and labor for the welder.

WELDING CATALOG

The Torchweld Equipment Company, at 224 North Carpenter Street, Chicago, has a new catalog, No. 29, covering the complete line of welding and cutting apparatus, including gas welding and cutting, lead welding, soldering, brazing and decarbonizing equipment, automatic and hand welding and cutting machines and torches, gas pressure regulators, acetylene generators and welding supplies.

This catalog also contains information about oxy-acetylene apparatus.

A copy of the catalog will be sent upon request to the company at the above address.

De Laval 50 hp. steam turbines using steam at 140 lbs. and exhausting against 30 lbs. back pressure and each driving two De Laval pumps. One pump handles 1500 gals. per min. of cooling water against 70 ft. head and the other 52 gals. per min. of 0.77 sp. gr., 90° F. gasoline against 50 lbs. There are five such units in this plant.

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De Laval steam turbines and centrifugal pumps are designed, built, inspected, guaranteed and tested complete in one plant and under the direction of one staff of engineers. That is one of the reasons why they give such uniformly satisfactory results.

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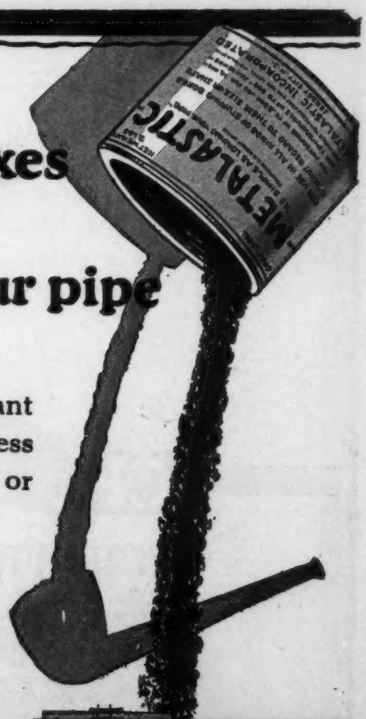

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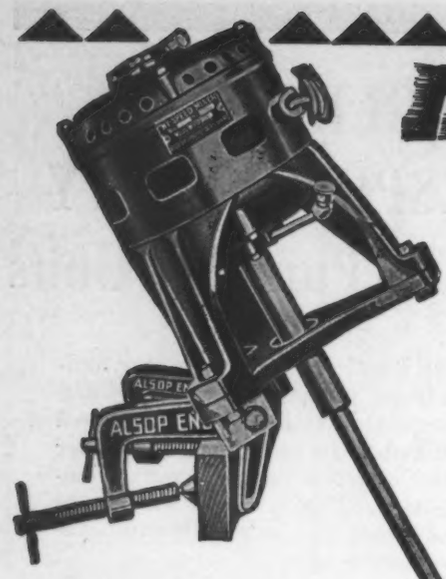

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They clamp to any tank or vat in one minute and produce a more thorough, rapid mix . . . . more economically than by any other process. Capacities from five to 50,000 gallons.

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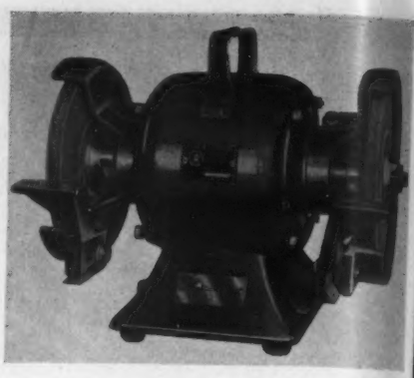

Portable Grinder

Portable Bench Grinder

BLACK & DECKER MANUFACTURING COMPANY

The Black & Decker Manufacturing Company, Towson, Maryland, has recently brought out a new six-inch ball bearing portable electric bench grinder. This introduces the ball bearing electric grinder within the price range of the six and eight-inch sleeve bearing tools. The anti-friction bearings offer an easier maintenance of wheel speeds under load.

This grinder is for use on alternating current only, maintaining a 3600 r. p. m. spindle speed on 60 cycle current and 3000 r. p. m. on 50 cycle current.

PAMPHLET ON BEDPLATES

Bedplates for types SVR and DVR speed reducers is the subject of a new publication, Circular 1856, issued by the Westinghouse Electric & Manufacturing Company. Information pertaining to construction, dimensions and weights, and motor sizes for bedplates with and without outboard bearing pedestals, is given in tabulated form, accompanied by outline drawings and illustrations.

Copies may be obtained from any Westinghouse sales office or from the advertising department of the Westinghouse Electric & Manufacturing Company at East Pittsburgh.

REFINERY SUPPLY COMPANY BULLETIN

The Refinery Supply Company, 621 East Fourth Street, Tulsa, is distributing Bulletin No. 14, which carries Ac-Me items, such as water columns, recording gravitometers, charts, R. S. gravity gas balance, R. S. portable dead weight tester, the R. S. orifice well tester and the R. S. charcoal tube adapter, as well as other products manufactured and sold by the Refinery Supply Company.

EXPECT EARLY COMPLETION OF TEXACO PLANT AT FILLMORE

Representing an expenditure of approximately $750,000, it is expected that improvements being rushed at the distillation plant of The Texas Company at Fillmore, in Ventura County, California, will be completed on November 1.

The modernization improvements will

The CF

THROTTLING REGULATOR

The Fulton Throttling Regulator maintains a constant pressure under varying conditions of load.

The Regulator is placed in the suction line to the compressor and is controlled by the pressure at the discharge acting on the diaphragm surface, which is balanced by weight on the lever.

A tendency of the discharge pressure to rise overbalances the weight on the lever and the valve moves toward its seat, throttling the suction sufficiently to restore and maintain the discharge pressure at a fixed point.

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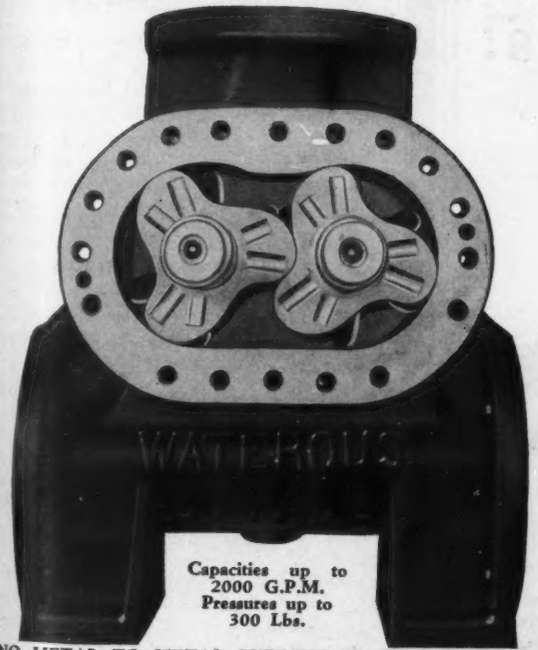
WATEROUS ROTARY PUMPS



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Steel pilot gears prevent rotors rubbing against each other. Patent Applied For. Hydraulic balance prevents faces of rotors rubbing pump heads. The radial grooves in the head and rotors accomplish this remarkable result. No external thrust bearings or adjustments are necessary. Send for our latest Bulletin.

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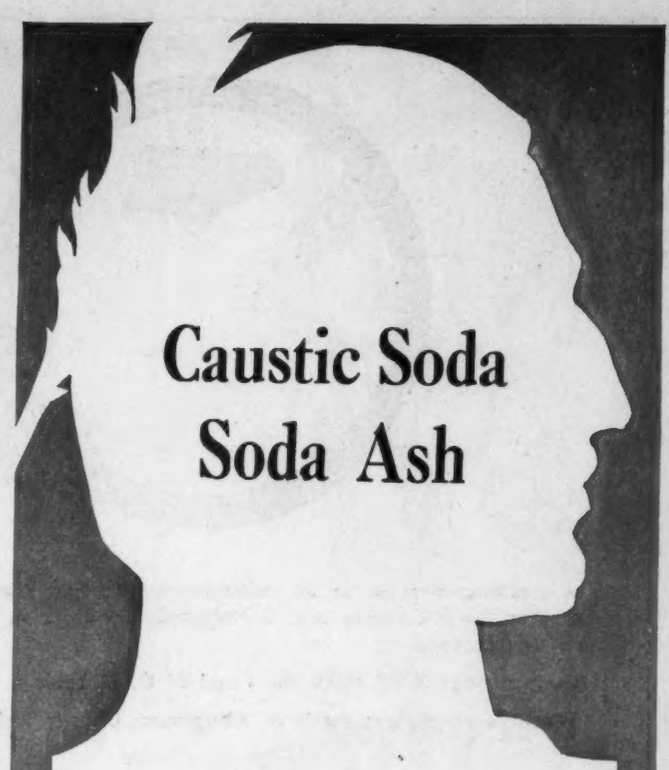

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Washers or gaskets made of Aluminum, Copper and other Metals.

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Non-Sparking Tools!

Eliminate the spark hazard in *your* plant! Equip your spray booths, cleaning rooms, and other working enclosures permeated with inflammable fumes . . . with PULMOSAN Ampco Non-Sparking tools.

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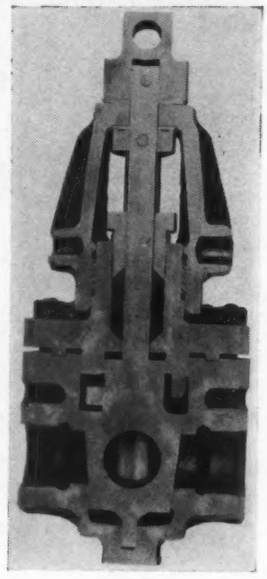
PULMOSAN

SAFETY EQUIPMENT CORPORATION

"If It's for Safety . . . We Have It."

182 JOHNSON STREET BROOKLYN, N. Y.

allow for a larger percentage of gasoline output from the 90,000 to 100,000 barrels of crude oil consumed each month, the improvements including new pressure still equipment to balance the plant with other improvements recently made. The force of employes will almost be doubled after operations are started. Pipe lines from the South Mountain and Shiells leases supply the plant with crude oil.



Columbus Plug Valve

High Pressure Plug Valve

COLUMBUS VALVE MANUFACTURING COMPANY

The Columbus Valve Manufacturing Corporation, 412 Spruce Street, Columbus, Ohio, is marketing its one-quarter turn high pressure plug valve of cast steel. The valves are made in sizes of from one to four-inch and for pressures of from 400 to 2000 pounds.

No lubrication is necessary in the operation of the Columbus high pressure plug valve, the manufacturer states.

These valves are being used on gas wells up to 1500 pounds pressure and in steel mills at 1000 pounds pressure, and at other places at lesser pressures.

Further information on this valve will be furnished from the company's above address upon request.

Loading Equipment

J. A. CAMPBELL COMPANY

Introduction is being made of a new type of tank truck and car safety loading equipment by J. A. Campbell Company, Long Beach California.

It is known as C & B loading equipment and is divided into two groups: a loading head which normally remains at the loading rack, and secondly, the tank truck or car equipment, consisting of an adapter ring or bushing, a cover plate and a sealed level gauge, all of which latter equipment is normally attached to the tank.

The manufacturers state that with this

type of loading equipment, hazards due to the escape of gasoline vapor during the loading of tank trucks or cars, are minimized, and that when used in connection with suitable vapor-recovery apparatus, it will soon pay for itself in gasoline saved from the vapor which would otherwise be wasted.

Bulletin No. 5, just issued, gives full details and may be obtained upon request.

An interesting catalog describing the Campbell absorption system may be obtained by communicating with the company, Box 669, Long Beach.

ORIFICE METER UTILIZATION

A new 6x9 book, bound in durable Castillian cover, containing 104 pages, about 100 illustrations and numerous tables, has been published by Metric Metal Works of American Meter Company for use in the operation of Westcott orifice meters for gas, air, steam, oil or water.

This book has been designated as Bulletin E-2 and is distinct from the new Catalogue EG-2 on Westcott orifice meters, which has also been made available to present and prospective users of this type of meter.

Other publications that have just been issued by Metric Metal Works of American Meter Company are:

Metric Rate—Volume Controller Bulletin E-5, describing the method of installation of rate-volume controllers for automatically controlling the rate of flow of air, gas, oil, steam, water and other liquids.

Bulletin E-3 Metric Indicating Flowmeters for gas, air, steam, oil and water.

Laboratory Bulletin E-1 containing complete description of American Meter Company's laboratory at Metric Metal Works, Erie, Pennsylvania, with detailed discussion of preparation of equipment and procedure during test.

COMBUSTION CONTROL BULLETIN

A new bulletin on automatic combustion control is now being distributed by the Bailey Meter Company of Cleveland.

Features of Bailey control, such as automatic readjustment of fuel—air ratio by the steam flow—air flow relation of the Bailey boiler meter, the maintenance of any desired excess air at any rating, and a master pressure contactor which anticipates changes in steam pressure and sends out impulses to provide for the new conditions before they actually appear, are described in this bulletin. It also explains how flexibility in both operation and application is secured through the use of selective drum switches, intermittent drive units, high speed reset clutches, and other mechanisms which make possible the safe automatic operation of dampers and fan motors in the proper sequence.

Interlocks to prevent a serious deficiency of air at high or low ratings, travel limits to protect against overtravel of dampers, rheostats, drum controllers and

Easily Applied!

Whether sprayed on, or applied with brush Dixon's Industrial Paints flow easily and cover thoroughly —reducing labor costs to a minimum.

Known to industry for more than 65 years as Dixon's Silica Graphite Paints, they are composed (except Bright Aluminum and Standard Red Oxide) of pure boiled linseed oil combined with flake silica graphite. This combination has been proved —over many years, and under various conditions of service— to give superior paint protection at lowest cost per gallon, when measured by years of service.

Dixon's Industrial Paints are now offered in 14 colors, including Bright Aluminum and Standard Red Oxide.

Write for Color Card No. 99-BI.

DIXON'S Maintenance Floor Paints

Give maximum protection to wood, composition, concrete and cement floors. Suitable for use either indoors or outside. Eight standard colors--write for color card No. 99-BF.

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D X N TRADE MARK *Established 1827* D X N TRADE MARK

DIXON'S INDUSTRIAL PAINTS

Acid-Proof Cement

Guaranteed to be acid, alkali and corrosion proof against all acids, alkalies and chemicals, —hydrofluoric acid alone expected. Our Acid-Proof Cement is widely used as a binder for Acid-Proof Brick and Tile.

May we send you a free sample tube?

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U.S.STONEWARE

WILCO VALVES

WILCO TANK CONTROL

Scores of installations in the California fields have proven this regulator.

The WILCO TANK CONTROL may be placed on the tank roof if desired, or it may be installed on the ground.

One regulator will operate equally well whether connected to one tank or to a group of tanks.

A WILCO TANK CONTROL will allow all the gasoline laden vapors to pass to the gathering line when gas is being generated and it will allow sufficient Dry gas to enter to prevent a vacuum being formed in the tank when gas volume shrinks.

ATMOSPHERIC pressure may be maintained or the regulator may be set to maintain slight pressure or slight vacuum.

BUILT IN ALL SIZES OF CAST IRON OR STAINLESS STEEL TRIMMED.

SIMPLE-COMPACT-RUGGED
EXTREMELY SENSITIVE

WILKINSON CONTROLLER CO.

5700 SANTA FE AVE. LOS ANGELES, CALIF.

WILCO VALVES

valves, time limits to prevent runaway conditions, handwheels for emergency operation and other safety features are covered in the bulletin.

BOOKLET ON EXPLOSIVES

"Commercial Explosives: Their Safe and Proper Use," is a new booklet just issued by the Hercules Powder Company, Wilmington, Delaware. This booklet is intended to aid users of explosives in improving blasting practices and avoiding accidents.

The booklet defines explosives, lists the various types and their characteristics, and offers directions for loading, priming and firing. Modern types and processes are enumerated.

Handling and storage of explosives is also covered and general safety rules cited, many of which are recommendations of the National Safety Council, the United States Bureau of Mines, and the Institute of Makers of Explosives. The booklet offers information on detonators, blasting machines, and other blasting accessories.

FLOW METER CATALOG

Brown Instrument Company is mailing out the second edition of the Brown flow meter catalog, No. 21, a 90-page book, containing a complete presentation of the general theory, use, design and practical application of the flow meter. It carries a detailed and well-illustrated description of the principle, construction and features of the Brown electric flow meter.

For the convenience of present and prospective users of Brown recording flow meters a complete list of Brown charts for recording flow, with plates illustrating representative chart sections, is included in the book.

This catalog contains 126 illustrations.

Copies of this catalog may be obtained by applying to the Brown Instrument Company, Philadelphia.

BLOWER BULLETINS

The American Blower Corporation's Bulletin No. 7818 describes the 1929 models of the Venturafin unit heaters as made by this company.

These units are made in four sizes to cover practically all industrial heating jobs. Each unit is equipped with deflectors to direct the heated air towards the floor and most models are furnished regularly with speed regulators to give various degrees of heat as required.

Further information about this equipment may be obtained by writing the company at its detroit headquarters, 6000 Russell Street, for a copy of the bulletin.

Bulletin 10401 of the American Blower Corporation has been published, showing standard forced draft fans suitable for making possible the use of low grade, cheap fuels. This bulletin also gives application and technical data of interest to anyone contemplating installations of this kind. Copies of this bulletin are also available upon request to the above address.

"the most effective means" of cleaning lubricating oil storage tanks

ONE western oil concern cleans 500 and 1000 barrel storage tanks thoroughly the Oakite way. So thoroughly in fact that a white cloth can be rubbed on the floors and seams afterward without soiling.

Tanks are simply drained and as much sediment as possible is mucked out. Then an Oakite solution is applied with long handled brushes and followed with a rinse. "This is the most effective means of doing the job that we have been able to find," says the superintendent.

Any cleaning job can be done quickly, thoroughly and economically with Oakite materials and methods. Our nearby Service Man is ready to show you how. Write and he will call.

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OAKITE PRODUCTS, INC., 50B Thames St., NEW YORK, N. Y.

Oakite Service Men, cleaning specialists, are located at

Albany, N. Y., Allentown, Pa., *Atlanta, Altoona, Pa., Baltimore, Battle Creek, Mich., *Boston, Bridgeport, *Brooklyn, N. Y., Buffalo, *Camden, N. J., Charlotte, N. C., Chattanooga, Tenn., *Chicago, *Cincinnati, *Cleveland, *Columbus, O., *Dallas, *Davenport, *Dayton, O., Decatur, Ill., *Denver, Des Moines, *Detroit, Erie, Pa., Fall River, Mass., Flint, Mich., Fresno, Calif., *Grand Rapids, Mich., Harrisburg, Pa., Hartford, *Houston, Texas, *Indianapolis, *Jacksonville, Fla., *Kansas City, Mo., *Los Angeles, Louisville, Ky., Madison, Wis., *Memphis, Tenn., *Milwaukee, *Minneapolis, *Moline, Ill., *Montreal, Newark, N. J., Newburgh, N. Y., New Haven, *New York, *Omaha, Neb., Oshkosh, Wis., *Oakland, Cal., *Oklahoma City, Okla., *Philadelphia, Phoenix, Ariz., *Pittsburgh, Pleasantville, N. Y., Portland, Me., *Portland, Ore., Poughkeepsie, N. Y., Providence, Reading, Pa., Richmond, Va., *Rochester, N. Y., Rockford, Ill., *Rock Island, Sacramento, *San Francisco, *Seattle, Springfield, Mass., South Bend, Ind., *St. Louis, *St. Paul, Syracuse, N. Y., *Toledo, *Toronto, Trenton, *Tulsa, Okla., Utica, N. Y., *Vancouver, B. C., Wichita, Kan., Williamsport, Pa., Worcester, Mass.

*Stocks of Oakite materials are carried in these cities.

OAKITE

TRADE MARK REG. U.S. PAT. OFF.

Industrial Cleaning Materials and Methods

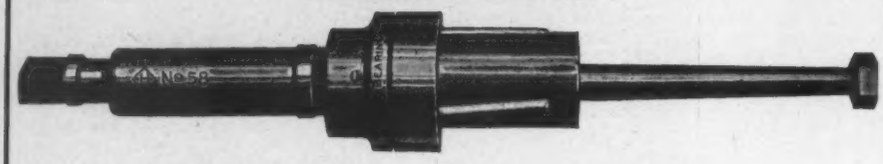
CRAFTSMANSHIP

A characteristic of the beaver and also of the skillful workmen who manufacture the products of The Garlock Packing Company, Palmyra, N. Y.

FELLING good-sized trees with their chisel shaped teeth, little beavers construct dams across streams with almost superhuman intelligence. After making their own "beaver pond" by backing up the water, they carefully select sticks, stones and mud with which to build their lodges at the edge of the pond. When completed, these "houses" are sufficiently strong and durable to withstand all the natural hazards of the locality in which they are situated. The entrances are under water—unseen and fully protected.

The mechanical ingenuity of the engineers and skilled workmen who build Quality Controlled Packings is not unlike the inherent craftsmanship of the beaver. Garlock trained craftsmen select all their crude materials with the greatest care by subjecting them to the most rigid laboratory tests. The basic quality of Garlock Packings is thus insured before the ingredients enter manufacture . . . and when completed the finished packings will give complete satisfaction on the intended installation as they are of a design and structure to meet its requirements.

Heavy Duty Expanders for Still Tubes



Tools for the Oil Industries

Hydraulic Pressure Pumps, 8000 pounds
Tube Expanders for Cracking Still Tubes
Hydraulic Pressure Pumps, 2000 pounds.
Tube Expanders for Condenser Tubes
Hydraulic Pressure Pumps, 500 pounds.
Tube Expanders for Steam Boilers
Screw Punches for Structural Shapes
Tube Expanders for Pipe Work
Screw Punches for Plate Work
Flaring Tools for Still Tubes
Beading Tools for Still Tubes
Hydraulic Jacks
Hydraulic Punches

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Established 1870
Expanders since 1884

LEAD LININGS

for Agitators, Tanks, Acid Recoveries —All Refinery Lead Work

A complete lead lining service is NOW—and for the FIRST TIME—available to the refineries of the Southwest. Heretofore no organization existed which handled this line of construction work, and it was therefore undertaken largely by novice Lead Burners, using makeshift equipments, devoid of efficient and economical results, much to the discredit of lead work in general.

Due to expansion and growth, Elmer Swearinger, an old commercial Lead Burner, operating in the field comprising Texas, Louisiana, Arkansas, Oklahoma and Kansas since 1916, now has an organization of skilled Lead Burners, complete rigging equipments (specially adapted), experience, technical knowledge and finance, adequate to any sheet lead installation.

Consult me before ordering material (sheet lead) for any installation. I know many "wrinkles" that will save you money, and tend to make a better job. Send blue print or sketch for contract bid, carrying a workmanship guarantee clause. Also, Lead Burners furnished for repair jobs at day work rates.

ELMER SWEARINGER

Lead Burning Contractor

P. O. Box 706 WICHITA, KANSAS Phone, Market 8219

COMPRESSOR CATALOG

De Laval Steam Turbine Company's new catalog on centrifugal compressors and blowers just issued by the company at Trenton, New Jersey, outlines the progress being made by centrifugal machinery in the field.

Turbine-driven blast furnace blowers rated at 60,000 cubic feet per minute against 30 pounds maximum pressure at 2800 r.p.m. are shown, and both the single and multi-stage blowers and boosters are given for use in water gas plants, and in connection with coal gas retorts and coke ovens.

The De Laval catalog gives a concise presentation of the mechanics and thermodynamics of the compression of gasses and the physical properties of industrial gasses, with numerous illustrative examples worked in detail.

THREE NEW BULLETINS

Leeds & Northrup Company, Philadelphia, has just issued catalog No. 86, a revised edition on "Optical Pyrometers," catalog No. 87, a revised edition on "Potentiometer Pyrometers," and Bulletin No. 870, "Petentiometers for Temperature Control in Oil Refining," in its revised form.

Copies of these bulletins may be had by writing the company, 4901 Stenton Avenue, Philadelphia.

OIL PURIFIER LEAFLET

The Sharples super centrifuge oil purifiers are discussed in leaflet No. 20240C recently released by the Westinghouse Electric & Manufacturing Company. The applications, features, operation, and construction of the units are explained in a concise manner. Included in the leaflet are various illustrations showing construction and application of the purifiers. The units may be obtained at capacities of from 180 to 1200 gallons.

HOUSTON OFFICE

Harry R. Bourne opened an office late in August at 512 Second National Bank Building, Houston, and will represent Dean Brothers Company, whose factory is at Indianapolis, Indiana, and the Dean Hill Pump Company, whose factory is at Anderson, Indiana. The Houston office will handle direct the products of these two manufacturing concerns, a general line of pumps for the producing and refining branches of the oil industry. Mr. Bourne has been in the oil field equipment business in the Southwest for many years.

FIRE FIGHTING CATALOG

"Modern Fire Fighting Equipment," catalog published by the American-La France & Foamite Corporation of Elmira, New York, is now ready for distribution.

The catalog contains complete listings and discriptions of practically every kind of portable fire-fighting equipment and is 176 pages in length.

EXCELS 11 WAYS!

1—***High Heat Resisting.*** **It contains the same unsurpassed Flake Graphite from which the famous Dixon Crucibles are made.**

2—***Hardens Quickly*** **and sets as an inert mass in cold or moderate temperatures.**

3—***Expands*** **instead of shrinking when subjected to higher temperatures and permanently remains in an expanded state assuring tight, leakless joints for years.**

4—***Cannot Be Dislodged*** **by high pressures, suction and vibration will not readily loosen.**

5—***Screw Thread Joints are permitted to be pulled up tight*** **due to the excellent lubricating qualities of the graphite.**

6—***Old or New Joints*** **are held tight notwithstanding uneven, battered or worn threads.**

7—***Contains No Acids*** **or anything of a contaminating, poisonous or objectionable orodous nature.**

8—***Will Not Flavor*** **the solutions conveyed.**

9—***Will Not Discolor*** **the solutions conveyed.**

10—***Simply Thin with Water.*** **Contains no oil, grease or acid.**

11—***Does Not Ferment.*** **Easy to keep without spoilage.**

Write for Circular No. 99-DS

JOSEPH DIXON CRUCIBLE CO.

Jersey City D X N **New Jersey**

Est. 1827

ENGINEERING FIRM OPENS NEW YORK OFFICE

Jackson Engineering Corporation has opened an office at 30 Church Street, New York City.

Karl Finsterbusch, who, with N. M. Floyd, completed arrangements for the New York office, recently paid a short visit to the Pacific Coast before returning to the main offices in Tulsa, where he and G. M. Jackson, president of the company, will have their headquarters in the future.

Floyd, formerly of the Los Angeles office, has been placed in charge of the Eastern territory, with headquarters in New York; and Hugh R. Lamberth is manager of the Pacific Coast division.

HOUSTON OFFICE OPENED

Naylor Pipe Company, Chicago, manufacturers of Naylor line pipe, announce the opening of a new sales office at 601-3 Post-Dispatch Building, Houston, and the appointment of E. C. Kirby as district sales manager in Texas and Louisiana with headquarters at the new Houston office.

The Refinery Supply Company is located in its new home, 621 East Fourth Street. Tulsa.

The Stacey Engineering Company has been organized as a holding company, and has taken over the Stacey Brothers Gas Construction Company, Cincinnati, the Connersville Blower Company of Connersville, Indiana, and Wilbraham-Green Blower Company of Pottsown, Pennsylvania.

The new company, which is an Ohio corporation, is headed by Beman G. Dawes, chairman of the board of the Pure Oil Company. With him are associated Carmi A. Thompson of Cleveland, F. S. Heath of Columbus and others, as well as a number of the operating heads of the concerns named.

IMPERIAL MAKES CHANGE IN PERSONNEL

Changes in the personnel of the Imperial Refiners, Incorporated, have been announced by C. M. Alexander, general manager. J. L. Farrell has been appointed general superintendent of refineries and will be stationed at headquarters in Tulsa. He was formerly with the Producers & Refiners Corporation at Parco, Wyoming.

J. F. Readron has been promoted to general manager of the plant at Ardmore, where he was formerly superintendent. W. M. Perry has been named superintendent at this plant.

J. B. Saunders, who was sales manager of the Kettle Creek Refining Company, an Imperial Refiners, Incorporated, subsidiary, has been promoted to the post of sales manager for the Imperial and the Wicket Refining Company. He succeeds R. M. Moon, resigned.

H. E. Ericson, formerly sales manager for the Houston Oil Company at Camden, Arkansas, succeeds Mr. Saunders as sales manager for the Kettle Creek Refining Company at El Dorado, Arkansas.

SALES ENGINEER

An opportunity for a permanent position for an experienced refinery engineer, capable of representing this company in its selling division. The successful applicant must be an authority on refining processes, competent to discuss new projects with the executives of the largest refineries in the industry. He must also have sales ability and personality that will enable him to negotiate sizeable contracts. If you have these qualifications, we will arrange a personal interview at your convenience. All applications will be considered strictly confidential.

SMITH ENGINEERING CO.
107 W. Linwood Blvd.
Kansas City, Missouri

ENGINEERING DRAFTSMEN

Several openings are available for engineering draftsmen, experienced in refinery design and especially in large refinery piping layouts. Apply by letter only, outlining your past experience, and giving all essential information. Applications will be held confidential, and personal interviews arranged later.

SMITH ENGINEERING CO.
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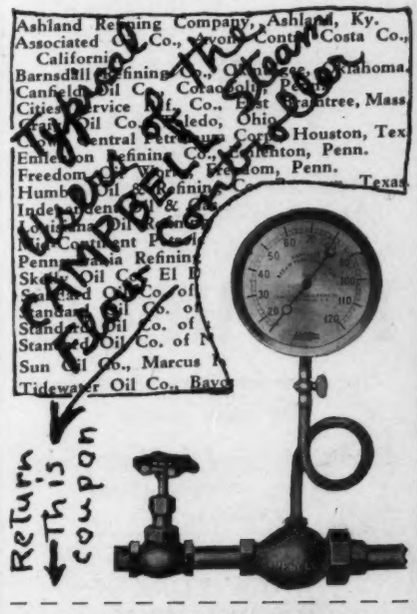
Kansas City, Missouri


Ashland Refining Company, Ashland, Ky.
Associated Oil Co., Avon, Contra Costa Co., California
Barnsdall Refining Co., Oklahoma.
Canfield Oil Co., Coraopolis, Penn.
Cities Service Ref. Co., East Braintree, Mass.
Crain Oil Co., Toledo, Ohio
Central Petroleum Corp., Houston, Tex.
Emlenton Refining Co., Emlenton, Penn.
Freedom Oil Works, Freedom, Penn.
Humble Oil & Refining Co., Texas
Independent Oil & Gas Co.
Louisiana Oil Refining Co.
Mid-Continent Petroleum Co.
Pennsylvania Refining Co.
Skelly Oil Co., El Dorado
Standard Oil Co. of Indiana
Standard Oil Co. of Louisiana
Standard Oil Co. of New Jersey
Sun Oil Co., Marcus Hook, Penn.
Tidewater Oil Co., Bayonne, N. J.
Type of Steam Control you are using
Return This Coupon

The Campbell Engineering Co.
1060 Broad St., Newark, N. J.

Manufacturers of the TAR BABY BURNER, to handle Fuel Oils, Water Gas, Tar, Acid Sludge, and Residue Fuels.

Without obligating us in any way, please send information on ( ) the Watermelon Type of Steam Control for Oil Stills; ( ) the Pumpkin Seed Type, ( ) the Tar Baby Oil Burner for burning residue and other fuels.

Name .....

Firm .....

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Rubshell

FOR

Inside of Tanks

WITHSTANDS

H_2S & H_2SO_4

and other corrosives met with in Refineries

THE ONLY PAINT TRIED, TESTED and USED EXTENSIVELY by the PRINCIPAL COMPANIES

Also for condensers, agitators, kettles, exchangers, etc.

STOP THAT CORROSION TO-DAY!

VOLCO

HOLZAPFEL'S HEATPROOF PROTECTIVE

WITHSTANDS

RED HEAT!

Use it on any surface too hot for other paints

Extensively used for hot smoke stacks, exhaust pipes, mufflers, etc.

NEW YORK
INTERNATIONAL COMPOSITIONS CO., INC.
25 Broadway

TULSA, OKLA.
NATIONAL TANK SEAL CO.

HOUSTON, TEXAS
RUBSHELL, TEXAS, INC.
Post-Dispatch Bldg.

NEW NATURAL GASOLINE COMPANY FORMED

The Philmore Gasoline Corporation of Delaware, with offices at 412 Philtower Building, Tulsa, is building a 12,000-gallon absorption gasoline plant in the Bryson pool of Jack County, Texas.

Officers of the corporation are Forrest E. Gilmore, president and general manager; F. E. Rice, superintendent of the refining department of Phillips Petroleum Company, as vice president; Carl W. Gilmore, secretary and treasurer, and A. W. Watkins, assistant secretary and treasurer.

Capitalization of the corporation is $200,000, which is subscribed one-half by the Phillips Petroleum Company and one-half by the Airolene Gasoline Corporation. The Airolene Gasoline Corporation recently built a 6000-gallon natural pressure absorption gasoline plant near Shamrock, Texas. Forrest E. Gilmore is also president and general manager of the Airolene Gasoline Corporation.

Stanley Cosden has succeeded Wayne Rice as superintendent of the Big Spring, Texas, skimming and cracking plant of the Cosden Oil Company. Rice resigned in September. Cosden is a son of J. S. Cosden, president of the Cosden Oil Company, and was superintendent of the Big Spring plant of Richardson Refining Company, which is an affiliated company.

Natural gasoline production of the Marshall pool, Logan County, Oklahoma, plant of J. S. Cosden, Inc., is to be shipped to the Big Spring, Texas, plants of Cosden Oil Company and Richardson Refining Company for blending. A freight rate of 27½ cents per 100 pounds has been authorized in making tank car shipments from Lovell, which is the shipping point for the Oklahoma plant. The initial operations on the absorption plant will begin late in October, with an expected production of 30,000 gallons daily.

B. H. Barnes has been transferred from the Port Arthur plant of Gulf Refining Company to Sweetwater, Texas, to take charge of operations of the 5000-barrel daily capacity refinery completed by the company in the latter city in September. This new plant is the third one in Texas for Gulf Refining Company, and is supplied with West Texas crudes by direct lines of the Gulf Pipe Line Company. A number of old employes from the Port Arthur and Fort Worth plants of the company have been transferred to Sweetwater for better positions. C. S. Hudgins, yard foreman, and E. C. Aston, stillman, at the Fort Worth plant, were among those transferred.

The State Gasoline Corporation has let a contract for a 30,000-gallon natural gasoline plant, to be built in Long Beach, Pine at Thirty-first Street, the J. A. Campbell Company receiving the award. Time for completion is set for 35 days.

This installation calls for an unusually large amount of heating surface, as well as cooling and condensing surface.

GEORGE D. WILLIAMS

George D. Williams, sales manager of the Hancock Oil Company of Long Beach, California, one of the stronger independent producing and refining concerns on the Pacific Coast, was recently named vice-president of the corporation by the board of directors, succeeding J. Walker Hancock, one of the founders of the company, who died August 3.

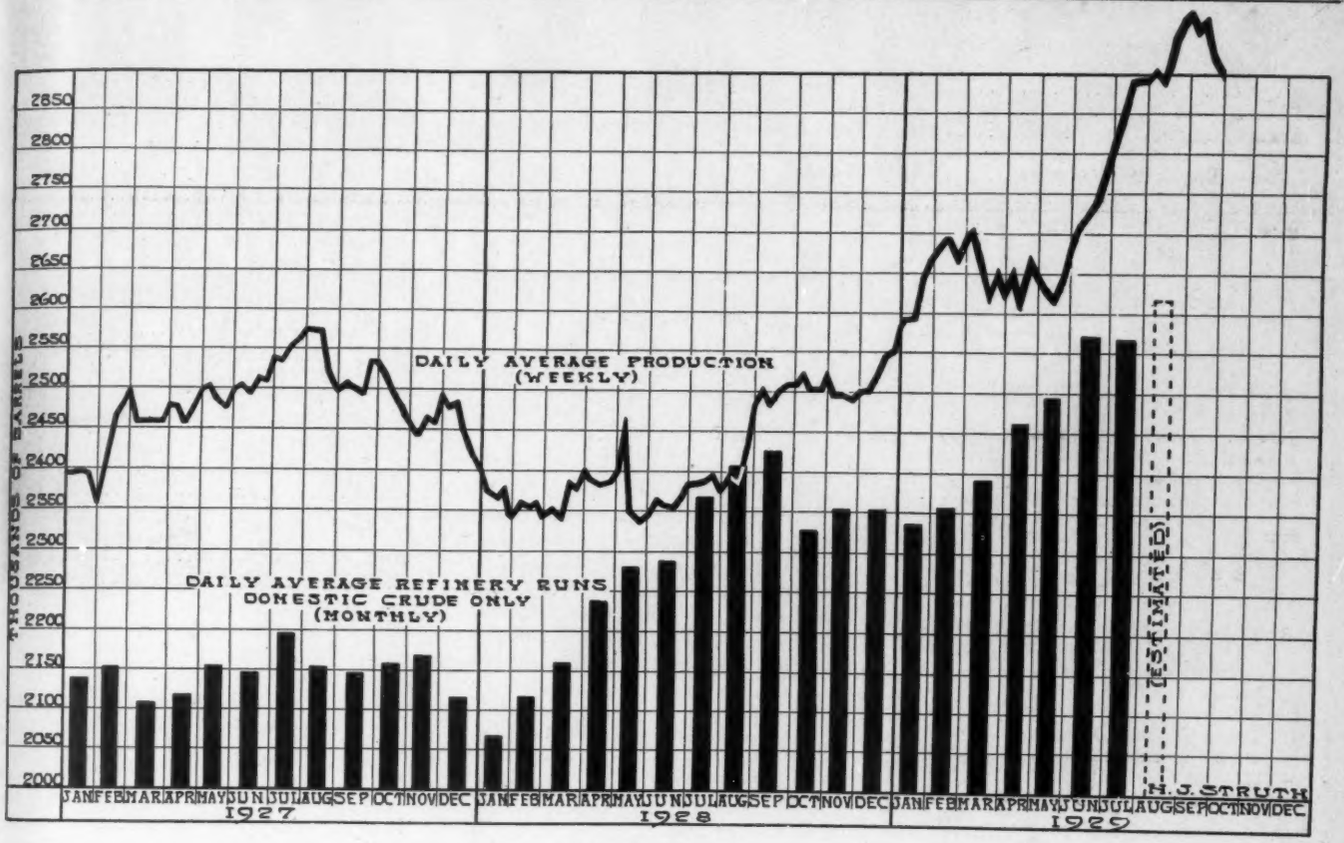
Mr. Williams joined the Hancock organization in 1923, the year of the company's birth, and has been sales manager since 1925. Prior to coming to California he was associated with the Cameron Refining Company of Ardmore, Oklahoma, the experience he gained in the Mid-Continent having proved of great value to him in handling the sales of the fast growing Hancock organization in California. Mr. Williams continues in charge of sales, and in addition will have general supervision over the refinery, pipe line and marine terminal departments.

NEW OFFICIALS FOR VALVOLINE OIL COMPANY

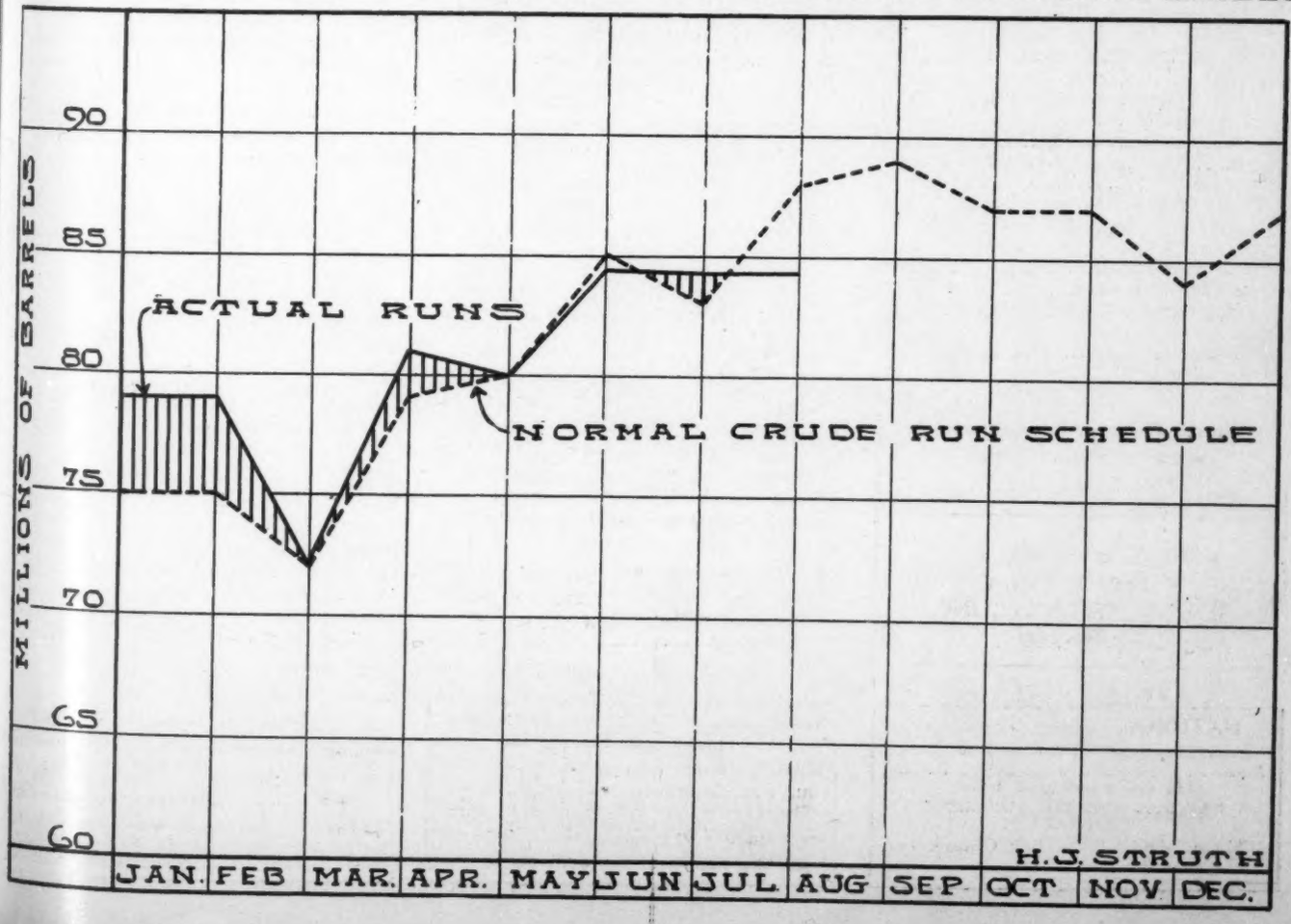
Following the purchase of control of the Valvoline Oil Company by the Paragon Refining Company, new officials of Valvoline Oil Company have been elected as follows: W. D. Ellis, chairman of the board; E. W. Edwards, president; Howard W. Edwards, H. W. Nuckols, John M. Marshall and George D. White, vice presidents; C. C. Gould, secretary and assistant treasurer; C. J. Leroux, treasurer, and K. C. Wyckoff, assistant secretary.

E. W. Edwards, Howard W. Edwards, William Cooper Proctor, John Omwake, Frederick W. Geier, W. W. Freeman, Charles Sawyer, George D. White and Howard I. Shepherd have been elected directors.

DOMESTIC PRODUCTION AND REFINERY RUNS



REFINERY RUNS OF DOMESTIC AND FOREIGN CRUDE TO STILLS



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